

## Introduction

Fluor Daniel, Inc. (FDI) was tasked by the Environmental Protection Agency (EPA) Region 6 to conduct Site Inspection Prioritization (SIP) activities at the Olin - Wallisville Rd. site, in Houston, Harris County, Texas (EPA ID No. TXD000607028). A phased approach was implemented for each site under this Work Assignment (WA). A preliminary site score was developed utilizing the PA-Score computer program. The PA-Score was completed using historical data provided by EPA Region 6. Additional data was then collected and a PREscore packaged was completed. This report summarizes the information which has been reviewed and collected for Olin - Wallisville Road Site.

## Site Description/Background Information

The Olin - Wallisville Road site (also known as the S.P. Oliver site) is an 18-acre lot located at 7621 Wallisville Road in Houston, Harris county, Texas. It is bordered on the north and west by residential lots, on the east by the Houston Belt and Terminal railway line, and on the south by Wallisville road (Figure 1) (2,001). The geographic coordinates of the site are 29° 17' 20" West longitude.

From 1938 to 1950, the Southern Acid and Sulfur Company owned and operated a sulfur plant at the location. the facility was purchased in 1950 by Olin Corporation ("Olin") for dry formulation of pesticides; liquid formulation of pesticides was added in 1955. during operations at the Olin Facility, two fire ponds and a disposal pit were located in the northern dumps, piles, and widespread areas of fugitive dust generation and deposition, many of which were covered during later construction activities. Prior to the installation of drainage tiles underneath the site in 1971, portions of the site would frequently remain under water for days during periods of high precipitation (4,009). The site drainage ditches lead to Hunting Bayou and then the houston Ship Channel, which is the major surface water drainage course for the area (6,002).

In 1972, the property was sold to Eureka Investment Company which demolished the facility, covered the entire site with 6-8 inches of soil, subdivided the lot and resold sections as follows: Southern Pacific Railroad acquired 9 acres comprising the eastern portion of the site, bordering the Houston Belt right-of-way. Southern Pacific Railroad covered their portion of the original Olin site with three feet of stabilized limestone and used the site for container storage. The remaining 9 acres were acquired by Mustang Industrial Equipment Company (owned by Eureka Investment Company) (3,002). Mustang in turn leased the northern 3 1/2 acres of their portion to Seatrain Service Inc. (6,001). Seatrain also stabilized their acreage with limestone and used it as a parking area for transport containers. Mustang Industrial Equipment was built on the southwest portion of the site.

In December, 1980, a preliminary survey of the area by EPA Region 6 revealed four toxaphene-containing piles approximately 18 inches high and 3-4 feet in diameter, on the north end of the railway right-of-way. In January 1981 the Houston Belt and Terminal

Railway Company "Houston Belt" contracted Rollins Environmental to remove these materials, which were then transferred to seven 55-gallon drums and removed to a licensed disposal facility (7, Attachment A1, 005).

During February, 1981, EPA, Region 6, conducted a subsequent sampling and analysis effort. In addition to the Houston Belt right-of-way, EPA also sampled properties occupied by Southern Pacific, Mustang and Seatrain, and several adjacent off-site locations. Three pesticides; toxaphene, DDT, and pentachloronitrobenzene (PCNB) were detected. Pesticide contamination also was found in the drainways bordering the north and east boundaries of the property (7, Attachment A1, 006).

A surface removal action conducted by Olin in compliance with an Attorney General's Order in 1988 removed 3 to 4 feet of affected soils from a drainage area to the north of the site: as well as from the railway right-of-way and site areas adjacent to the railway. Excavated areas were then re-filled with clean fill (8, 001). Currently, Texas Natural Resources Conservation Commission (TNRCC) is actively monitoring the site. The latest sampling inspection by TNRCC was conducted in June 1995.

#### **Waste Characteristics/Waste Quantity**

Weston presented a summary and short profile on the various compounds of potential concern at the S.P. Oliver site within their 1985 Site Assessment Report (3, 006-013). The contaminants of concern at the site (Compounds present at 10s to 100s of ppm) were: Lindane, Pentachloronitrobenzene, 4,4'-DDT, 4,4'-DDD, 4,4'-DDE; Toxaphene was detected within site soils at levels over 1,000 ppm (mg/kg) (12, 001). The waste material from the other section of the site was removed during the surface removal ordered by the Attorney General (8, 001).

#### **Ground Water Migration Pathway**

The site is located in the Beaumont geological formation, which is characterized by alternating layers of clay, silt, and sand derived from stream channel, point bar, natural levee and backswamp deposits. Thickness ranges from 100 feet with thinning to the northwest and thickening to the south. the Beaumont formation lies stratigraphically above the Montgomery Formation (also composed of alternating clays, silts and sand and approximately 100 + feet in the investigation area); the two units are hydraulically connected by basal sands and are the two upper units of the Chicot Aquifer (5, Attachment 1, 002).

The depth to ground water at the site is approximately 20 feet (4, 008). Annual precipitation for the region is 49.17 inches (25, 001); annual net precipitation at this location is 4.68 inches per year (26, 001).

There are numerous ground water wells within 1 4-mile radius of the site; however, as the site exists within an urban/industrial sector of the City of Houston, there are few domestic use wells within the first 3 miles of the site. There are no confirmed users of water derived

from wells within sectors lying within 1 1/2 to 1 mile radius of the site, 1 to 2 miles of the site, or 2 to 3 miles of the site. The majority of individuals utilizing ground water within this region obtain their water from either the City of Houston (3 wells located at slightly over 3 miles west/northwest of the site) or Jacinto City (3 wells also located at slightly over 3 miles east/southeast of the site).

Jacinto City is a town of approximately 10,000 people which obtains approximately 20% of its drinking water from its own wells with 80% supplied through surface water obtained from the City of Houston (16, 001). Based on these values, approximately 2,000 people from Jacinto City utilize ground water obtained from the three wells located within 3 to 4 miles of the site.

The City of Houston Municipal Water Supply supplies approximately 1.7 million people with water obtained from both ground water and surface water sources. the population served by ground water in Houston is approximately 738,836 (21, 001). The number of persons on average served by each of the wells within 4 miles of the site (three wells within the City of Houston "Northeast" well cluster) is 6,232. The total number of persons estimated to be served by the three Northeast wells is 18,695 (21 001).

There are approximately 20,695 people supplied with drinking water derived from ground water obtained from areas 3 to 4 miles from the site (City of Houston and Jacinto City wells).

### **Surface Water Migration Pathway**

The site drainage ditches enters into Hunting Bayou located approximately 1/3 mile from the site. Hunting Bayou flows for approximately 11 miles and enters into the Houston Ship channel (6, 002), (3, 003). The remainder of the 15-mile target distance limit (TDL) is within the Houston Ship Channel.

Although Hunting Bayou and the Houston ship Channel are perennial water bodies, recreational uses are at a minimum. Commercial fishing does not occur on these waters (13, 001). there are no drinking water intakes within the 15 mile TDL (14, 001); (10, 001); (10, 001).

### **Soil Exposure Pathway**

The site is fenced and located in an industrialized area within the City of Houston. Residential housing is present on the north and west borders of the Olin site; previous investigations of these areas have shown site contaminants to be present within the soils of some of these residential lots (8, 001); (9, 001- 005).

Based on GEMs population database (23, 002) and confirmed with topographical information (5, 001 - 004), there are no on-site residents, but 174 residents live within 1/4 mile of the site. There are no residents located between 1/4 and 1/2 mile of the site. The population within the 1/2 to 1 mile sector is 7588. There are no terrestrial or sensitive, environment,

schools or daycare centers located within 200 feet of an area of the site. The site and the area around the site have no obvious recreational attractiveness.

### **Air Migration Pathway**

The Texas Natural Heritage Program (TNHP) was contacted to evaluate the potential existence of endangered species within a 4-mile radius of the site (22, 001). TNHP personnel listed three species which could conceivably use this area as habitat, although the likelihood of finding these species was described as "very unlikely". the species were: Prairie Dawn, flowering annual, Texas Windmill Grass, grass species, Houston Machaeranthera, grass species.

Wetlands acreage totals approximately 180 acres 4 miles of the site (24, 001- 004). Based on GEMS population database, the resident population is 25,074 between 1 to 2 miles from the site, 38,483 from 2 to 3 miles, and 85,146 from 3 to 4 miles totaling 156,465 for a 4 mile radius.

No air release has been observed, and although some site-related compounds may be exposed at surface either on site, on adjacent lots or within drainways leading off site, the volatilities of the site contaminants are extremely low (7, Attachment A1,004).

### **Summary**

The Olin-Wallisville Road site (also known as the S.P. Oliver site) is an 18-acre lot located at 7621 Wallisville Road, Houston, Texas. The site is currently unused and sparsely vegetated, with some areas paved or overlain by concrete pads. From 1938 to 1950, the Southern Acid and Sulfur Company owned and operated a sulfur plant at the location. The facility was purchased in 1950 by Olin Corporation for the formulation of dry and liquid pesticides, which continued until the early 1970s.

Early sampling and analysis efforts by EPA at the site and adjacent locations revealed the presence of pesticides; toxaphene, DDT and PCNB. Pesticide contamination also was found in the drainways bordering the north and east boundaries of the property (7, Attachment A1, 006). Site oversight responsibilities were acquired by the Texas Natural Resources conservation Commission (TNRCC; at that time TDWR) in July, 1984. Since that time, TNRCC has conducted water, soil and air sampling at or near the site.

Olin conducted a surface removal at the site in 1988. Affected soils were removed from the eastern perimeter of the site (adjacent to the rail line) as well as along the site's northern boundary (which borders residential lots). This surface removal was conducted in compliance with an Attorney General's Order (8, 001).

Six municipal water supply wells are located within a 4-mile radius of the site. However, these wells are located between the 3 to 4 mile radius of the site. The surface water near the site is used for industrial release. Site contaminants have a very low solubility and volatility.

## References

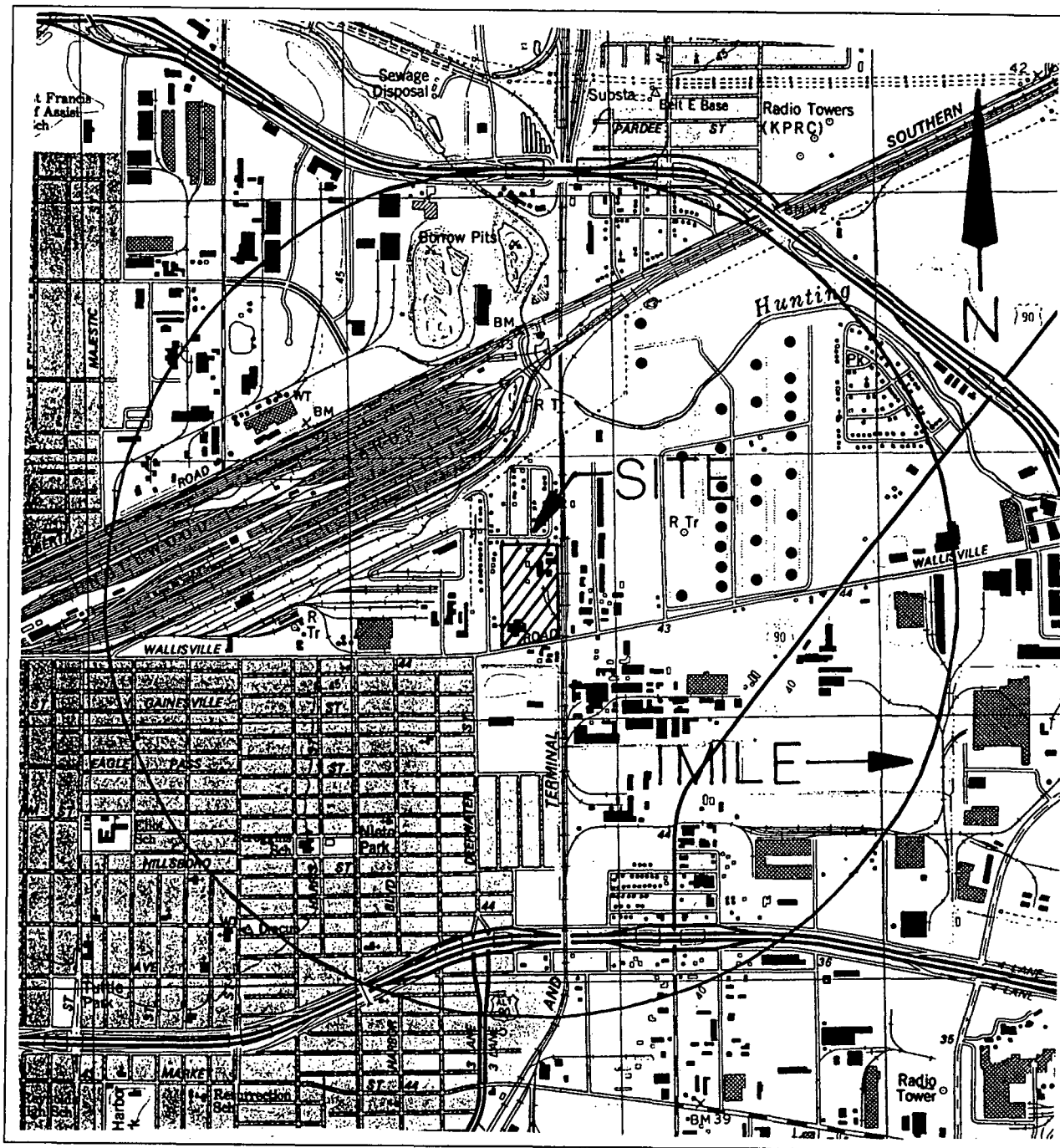
1. Record of Communication - To: Steve Hamm, TNRCC, Houston District Office, From: Ken Jensen, Fluor Daniel, Inc., - Regarding Current Agency (TNRCC) Activities at the S.P. Oliver Site, 05/17/95.
2. Record of Communication - To: Bob Devillier, City of Houston Zoning and Planning Department - From: Ken Jensen, Fluor Daniel, Inc., - Regarding Zoning of the S.P. Oliver site 05/16/95.
3. U.S. Environmental Protection Agency, 1980. Potential Hazardous Waste Site Inspection Report. Author Bill Carrothers, 12/29/80. (Included in EPA file)
4. Herschfield, David M., 1961, U.S. Department of Commerce - U.S. Weather Bureau. Technical Paper Number 40 - Rainfall Frequency Atlas of the United States.
5. U.S. Environmental Protection Agency, Graphical Exposure Modeling System (GEMS) Database, compiled from the U.S. Census Bureau 1990 data, accessed 03/27/95.
6. U.S. Environmental Protection Agency, 1985. Hazard Ranking System scoring document, 10/10/85. (Included in EPA file)
7. Texas Water Development Board, Records of Wells, Springs, and Test Holes for Harris County, 1995. (Included in EPA file)
8. Record of Communication - To: Rudy Hodge, Water Engineer, City of Houston - From: Ken Jensen, Fluor Daniel, Inc., - Regarding City of Houston Water Supply, 05/30/95.
9. U.S. Environmental Protection Agency. Final Rule Hazard Ranking System, FR51532-51667, December 14, 1990.
10. Record of Communication - To: Tom Parker, Harris County Flood Control District, - From: Ken Jensen, Fluor Daniel, Inc. - Regarding Surface Water Usage in Areas Adjacent and Downstream of the S.P. Oliver Site, 06/02/95.
11. Record of Communication - To: Dave Terry, Texas Natural Resources Conservation Commission - From: Ken Jensen, Fluor Daniel, Inc. - Regarding Wellhead Protection Areas in vicinity of S.P. Oliver site.
12. Record Of Communication - To: Johnnie Kennedy, TNRCC, Houston District Office - From: Ken Jensen, Fluor Daniel, Inc. - Regarding Current Agency (TNRCC) Activities at the S.P. Oliver Site, 05/17/95.

13. Ecology and Environment, Inc., February 10, 1982. Memorandum - From: Imre Sekelyhidi, Environmental Engineer, E&E, Region VI - To: Dave Peters, Chief, Hazardous Wastes Section. (Included in EPA file)
14. Roy F. Weston, Inc., 1985, Site Assessment Report on S.P. Oliver Pesticide Plant, Houston, Harris County, Texas, 10/21/85. (Included in EPA file)
15. Facsimile Transmission - From: Tom Michel, Data Processing Manager, Harris-Galveston Coastal Subsidence District - To: Ken Jensen, Fluor Daniel, Inc. - Regarding Registered Wells Located Within a 4-Mile Radius of the Site, 05/19/95.
16. Record of Communication - To: Mark Leudke, Lance Robinson, TNRCC Fisheries Personnel Covering Galveston Bay - From: Ken Jensen, Fluor Daniel, Inc. - Regarding recreational and Commercial Fishing Within Hunting Bayou and The Houston Ship Channel, 05/15/95.
17. Stennie Meadours, TNRCC, 1990. Memo - To: Ernest Heyer, Head, Program Services Unit, Field Operations Division, TNRCC (Texas Water Commission). Subject: "Olin/Texas Water Commission Settlement Agreement; Sample Analysis Results", 05/17/90.
18. Record Of Communication - To: Shannon Breslin, Texas Natural Heritage Program - Resource Protection Division - From: Ken Jensen, Fluor Daniel, Inc., Regarding Endangered Species Within the TDL of the S.P. Oliver Site, 05/23/95.
19. U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory Maps: Stettegast, TX, Jacinto City, TX, Park Place, TX, Pasadena, TX.
20. U. S. Geological Survey, 7.5-minute topographic maps: Settegast (1982), Jacinto City (1982), Park Place (1982) and Pasadena (1983), Texas.
21. Texas Water Resources Data, Water Year 1991, Volume 2. San Jacinto River Basin, Brazos River Basin, San Bernard River Basin, and Intervening Coastal Basins. U.S. Geological Survey Report TX-91-2.
22. U.S. Department of Commerce County and City Data Book, 1994.
23. Land Resources Laboratory Map Series: Land and Water Resources - Houston-Galveston Area Council. Bureau of Economic Geology, 1975.
24. U.S. Geological Survey, Water Resources Investigations Report 87-4153. Ground-Water Withdrawals and Changes in Ground-Water Levels, Ground-Water Quality, Etc. in the Houston District, Texas, 1980-84.

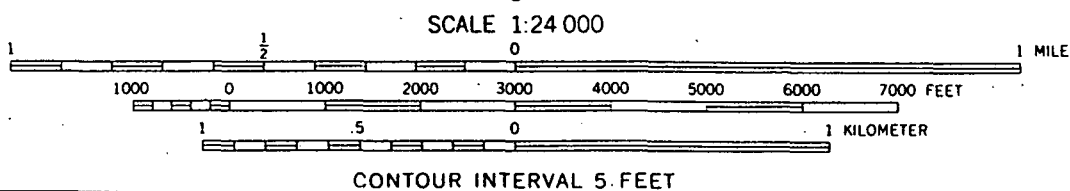
25. Geologic Atlas of Texas, Houston Sheet, 1:250,000. Bureau of Economic Geology, Austin, Texas, 1982.
26. U.S. Environmental Protection Agency. Hazard Ranking System Guidance Manual. EPA540-R-92-026. November 1992.
27. Record of Communication - To: John Cooper, Jacinto City Water Department - From: Ken Jensen, Fluor Daniel, Inc. - Regarding Jacinto City Water Supply, 05/22/95.

**FIGURE 1**  
**SITE LOCATION MAP**






Note: Topographic Maps, Settegast Quadrangle, 1982.



**FIGURE 1**  
**SITE LOCATION MAP**  
 Olin-Wallisville Road (S.P. Oliver) Site  
 EPA ID No. TXD000607028  
 Houston, Harris County, Texas

#### **REFERENCE 1**

**Record of Communication To: Steve Hamm, TNRCC, Houston District Office From: Ken Jensen, Fluor Daniel, Inc., Regarding Current Agency (TNRCC) Activities at the S.P. Oliver Site, 5/17/95.**

**Date:** 17 May 95  
**Time:** 2:45 pm PST  
**Call From:** Steve Hamm  
**Entity/Position:** Site Project Manager - TNRCC  
**Phone #:** (713) 625-7305  
  
**To:** Ken Jensen   
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106

**Relevant Information:**

Steve called back with additional information in response to questions we had discussed earlier in the day:

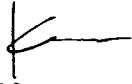
- 1) Although a surface removal action was planned as far back as 1985, no action was taken at the site until late 1988 or early 1989. TNRCC was providing oversight on the site at this time and had been doing so since the early 80s. TNRCC does not have in its possession reports to indicate exactly on what dates the removal actions at the site took place, nor are there any reports confirming the effectiveness of the removal action in terms of decreasing significantly the levels of contaminants remaining on site. An August 1989 report of samples derived from site soils/sediments showed 10s to 100s of ppm (mg/kg) of pesticides remaining on site soils following the surface removal activities. Because of this, additional sampling was ordered (executed early in 1995); the laboratory analysis of these samples has not been performed as of 17 May 1995.
- 2) Documentation in the possession of TNRCC does not specify which firm or entity oversaw the removal action; documents only state that "Olin" was the party executing the removal action. Woodward Clyde was named in one document as a party to "provide recommendations" on the excavation, but it is not clear whether they were at the site representing the PRPs or the TNRCC. TNRCC documents indicate Olin was planning to remove soils in some areas to 3 ft depth and in other more highly contaminated areas down to 4 ft. All areas were then backfilled with clean fill.
- 3) The ditch which is indicated within older documents as running down the center of the site is still in existence, although this area was subjected to soils removal and backfilling in the 1988/1989 surface removal action. Excluding the area occupied by Mustang equipment, the site consists of vegetated soils and pads of structural concrete. The site is fenced. Salina St. borders the site to the north.

**REFERENCE 2**

**Record of Communication to: Bob Devillier, City of Houston Zoning and Planning Department,  
From: Ken Jensen, Fluor Daniel, Inc., Regarding Zoning of the S.P. Oliver site 5/16/95.**

**Date:** 16 May 95  
**Time:** 2:05 pm PST

**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106



**To:** Bob Devillier  
**Entity/Position:** City of Houston - Zoning and Planning Dept  
**Phone #:** (713) 754-9616

**Relevant Information:**

Bob provided the following information on the site located at 7621 Wallisville Rd., Harris Co.:

On FEMA maps the site is zoned "X", appears on panel 245G (map date 9/28/90).

### **REFERENCE 3**

**U.S. Environmental Protection Agency, 1980. Potential Hazardous Waste Site Inspection Report.  
Author Bill Carrothers, 12/29/80. (Included in EPA File)**



POTENTIAL HAZARDOUS WASTE SITE  
SITE INSPECTION REPORT

REGION 6 SITE NUMBER (to be assigned by HQ)  
TX1538

**GENERAL INSTRUCTIONS:** Complete Sections I and III through XV of this form as completely as possible. Then use the information on this form to develop a Tentative Disposition (Section II). File this form in its entirety in the regional Hazardous Waste Log File. Be sure to include all appropriate Supplemental Reports in the file. Submit a copy of the forms to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force (EN-335); 401 M St., SW; Washington, DC 20460.

**I. SITE IDENTIFICATION**

|   |                                |   |                       |
|---|--------------------------------|---|-----------------------|
| A. SITE NAME S.P. OLIVER YARD (SO. PACIFIC TRANS CO.) & MUSTANG INDUSTRIAL EQUIPMENT  |                                | B. STREET (or other identifier) 7600 Wallisville Road |                       |
| C. CITY Houston   | D. STATE TX                    | E. ZIP CODE 77020                                     | F. COUNTY NAME Harris |
| G. SITE OPERATOR INFORMATION  |                                | 2. TELEPHONE NUMBER (713) 223-6591                    |                       |
| 1. NAME S.P. Oliver Yard: Mr. Dan Novasad, Yard Manager<br>Mustang Industrial: Mr. Chuck Chalker, Prop. Manager   |                                | (713) 460-2000  |                       |
| 3. STREET Southern Pacific Trans. Co., Wallisville & Lockwood Rd.   | 4. CITY P.O. Box 15640 Houston | 5. STATE TX   | 6. ZIP CODE 77020     |
| H. REALTY OWNER INFORMATION (if different from operator of site)  |                                | 2. TELEPHONE NUMBER                                   |                       |
| 1. NAME S.P. Oliver Yard-Same as lg. above<br>Mustang: Eureka Investment Co.  |                                | 4. STATE TX 5. ZIP CODE 77020                         |                       |
| I. SITE DESCRIPTION An 18 acre site formerly occupied by a pesticide formulating plant owned and operated by the Olin Corporation. <i>OLIN CORP - S.P. OLIVER</i>   |                                |   |                       |
| J. TYPE OF OWNERSHIP<br><input type="checkbox"/> 1. FEDERAL <input type="checkbox"/> 2. STATE <input type="checkbox"/> 3. COUNTY <input type="checkbox"/> 4. MUNICIPAL <input checked="" type="checkbox"/> 5. PRIVATE |                                |   |                       |

**II. TENTATIVE DISPOSITION (complete this section last)**

|   |   |                                    |  |
|---|---|------------------------------------|--|
| A. ESTIMATE DATE OF TENTATIVE DISPOSITION (mo., day, & yr.) | B. APPARENT SERIOUSNESS OF PROBLEM<br><input type="checkbox"/> 1. HIGH <input type="checkbox"/> 2. MEDIUM <input checked="" type="checkbox"/> 3. LOW <input type="checkbox"/> 4. NONE |                                    |  |
| C. PREPARER INFORMATION                                     |   |                                    |  |
| 1. NAME <i>Bill Carrothers</i><br>Bill Carrothers           | 2. TELEPHONE NUMBER (214) 742-4522  | 3. DATE (mo., day, & yr.) 12/29/80 |  |

**III. INSPECTION INFORMATION**

|   |  |  |
|---|--|--|
| A. PRINCIPAL INSPECTOR INFORMATION  |  |  |
| 1. NAME Mr. Bill Carrothers   | 2. TITLE FIT Chemist   |  |
| 3. ORGANIZATION Ecology and Environment, Inc.                                 | 4. TELEPHONE NO. (area code & no.) (214) 742-4522            |  |
| B. INSPECTION PARTICIPANTS  |  |  |
| 1. NAME   | 2. ORGANIZATION  | 3. TELEPHONE NO.   |
| Mr. H.K. Ray  | Ecology and Environment, Inc.<br>1509 Main, Dallas, TX 75201 | (214) 742-4522   |
| Mr. Clarence Johnson  | TDWQ, Deer Park, TX  | (713) 479-5981   |
| C. SITE REPRESENTATIVES INTERVIEWED (corporate officials, workers, residents) |  |  |
| 1. NAME   | 2. TITLE & TELEPHONE NO.                                     | 3. ADDRESS   |
| David S. Harcus   | Equipment Dispatcher<br>Seatrail Pacific Services            | Salina Street Office<br>Houston, TX 77020                  |
| Mr. Ben Torrance  | Finance Manager<br>Mustang Industrial Equipment Co.          | 7607 Wallisville Rd.<br>Houston, TX 77020                  |
| Mr. Chuck Chalker   | Property Manager<br>Mustang Industrial Equipment Co.         | " "  |
| Mr. Dave Hesser   | Chemical Engineer<br>Nutro Products Corp.                    | 7610 Wallisville Rd.<br>(P.O. Box 21187) Houston, TX 77026 |
|   |  |  |
|   |  |  |

#### **REFERENCE 4**

**Herschfield, David M., 1961, U.S. Department of Commerce - U.S. Weather Bureau. Technical Paper Number 40 - Rainfall Frequency Atlas of the United States.**



U.S. DEPARTMENT OF COMMERCE  
LATHIER H. HODGES, Secretary

WEATHER BUREAU  
F.W. REICHELDEUFER, Chief

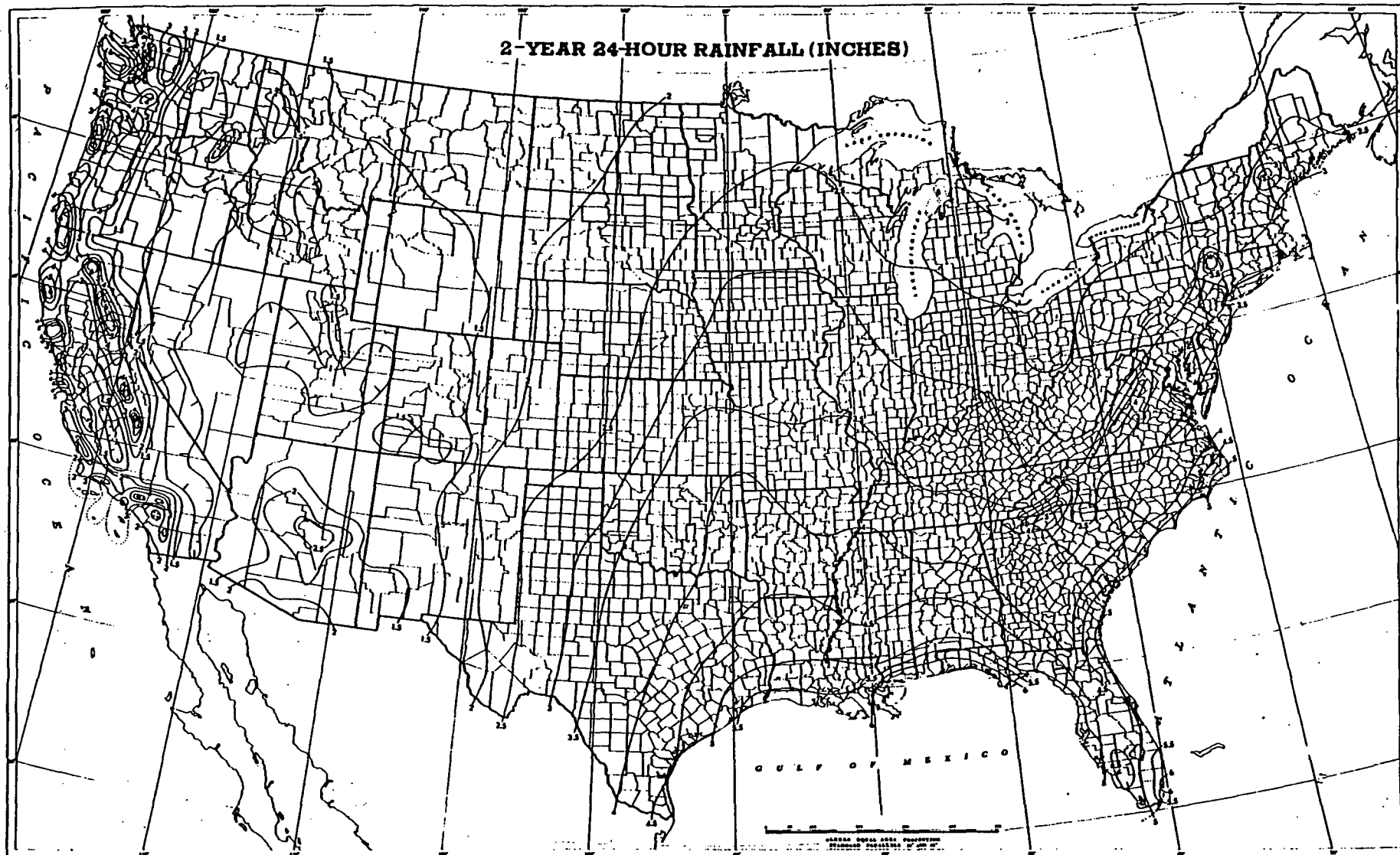
TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and  
Return Periods from 1 to 100 Years

Prepared by  
DAVID M. HERSHFELD  
Cooperative Studies Section, Hydrologic Services Division  
for  
Engineering Division, Soil Conservation Service  
U.S. Department of Agriculture





#### **REFERENCE 5**

**U.S. Environmental Protection Agency, Graphical Exposure Modeling System (GEMS) Database,  
compiled from the U.S. Census Bureau 1990 data, accessed 3/27/95.**

## COVERAGE

=====

STATE COUNTY STATE NAME

COUNTY NAME

48 201 Texas

Harris Co

CENTER POINT AT STATE : 48 Texas

COUNTY : 201 Harris Co

## REGION OF THE COUNTRY

=====

Zipcode found: 77020 at a distance of 3.9 Km

| STATE | CITY NAME | COMMUNITY     | FIPSCODE | LATITUDE | LONGITUDE |
|-------|-----------|---------------|----------|----------|-----------|
| ----- | -----     | -----         | -----    | -----    | -----     |
| TX    | HOUSTON   | DENVER HARBOR | 48201    | 29.7767  | 95.3283   |

# CENSUS DATA

=====

Olin Corp.

LATITUDE 29:47:26 LONGITUDE 95:17:27 1990 POPULATION

|    | 1         | 2         | 1.0       | 2         | 3         | 4         | SECTOR |
|----|-----------|-----------|-----------|-----------|-----------|-----------|--------|
| KM | 0.00-.400 | .400-.800 | .800-1.60 | 1.60-3.20 | 3.20-4.80 | 4.80-6.40 | TOTALS |

|     |     |   |      |       |       |       |       |
|-----|-----|---|------|-------|-------|-------|-------|
| S 1 | 0   | 0 | 0    | 4841  | 6460  | 20525 | 31826 |
| S 2 | 0   | 0 | 108  | 1657  | 1524  | 14901 | 18190 |
| S 3 | 0   | 0 | 2500 | 7178  | 7900  | 24272 | 41850 |
| S 4 | 174 | 0 | 4980 | 11398 | 22599 | 25448 | 64599 |

|        |     |   |      |       |       |       |        |
|--------|-----|---|------|-------|-------|-------|--------|
| RING   | 174 | 0 | 7588 | 25074 | 38483 | 85146 | 156465 |
| TOTALS |     |   |      |       |       |       |        |

## STAR STATION

=====

| WBAN   |                            |          | PERIOD OR. DISTANCE     |
|--------|----------------------------|----------|-------------------------|
| NUMBER | STATION NAME               | LATITUDE | LONGITUDE RECORD (km)   |
| 12918  | HOUSTON/HOBBY TX           | 29.6500  | 95.2833 1964-1968 15.6  |
| 12960  | HOUSTON/INTCONT TX         | 29.9833  | 95.3667 1981-1985 22.6  |
| 12906  | HOUSTON/ELLINGTON TX       | 29.6167  | 95.1667 1966-1970 22.7  |
| 12923  | GALVESTON/SCHOLES TX       | 29.2667  | 94.8667 1956-1960 71.2  |
| 12917  | PRT ARTHUR/JEFFERSON CO TX | 29.9500  | 94.0167 1981-1985 124.0 |
| 93987  | LUFKIN/ANGELINA CO TX      | 31.2333  | 94.7500 1967-1971 168.4 |
| 12912  | VICTORIA/FOSTER TX         | 28.8500  | 96.9167 1965-1974 189.0 |

U.S. SOIL DATA

=====

STATE : TEXAS

LATITUDE : 29:47:26 LONGITUDE : 95:17:27

THE STATION IS INSIDE H.U. 12040104

|                                |   |                           |          |
|--------------------------------|---|---------------------------|----------|
| GROUND WATER ZONE              | : | 10                        |          |
| RUNOFF SOIL TYPE               | : | 1                         |          |
| EROSION                        | : | 1.1210E-03                | CM/MONTH |
| DEPTH TO GROUND WATER BETWEEN  | : | 3.0000E+03 AND 3.0000E+03 |          |
| FIELD CAPACITY FOR TOP SOIL    | : | 6.0000E-02                |          |
| EFFECTIVE POROSITY BETWEEN     | : | 2.0000E-02 AND 3.0000E-01 |          |
| SEEPAGE TO GROUNDWATER BETWEEN | : | 4.6330E+03 AND 1.3900E+04 | CM/MONTH |
| DISTANCE TO DRINKING WELL      | : | 2.8000E+04                | CM       |

**REFERENCE 6**

**U.S. Environmental Protection Agency, 1985. Hazard Ranking System Scoring document, 10/10/85  
(Included in EPA File).**

**REFERENCE 7**

**Texas Water Development Board, Records of Wells, Springs, and Test Holes for Harris County,  
1995 (Included in EPA File).**



How many...

TEXAS WATER DEVELOPMENT BOARD  
GROUND WATER DATA SYSTEM

RECORDS OF WELLS, SPRINGS, AND TEST HOLES  
COUNTY - Harris

Site # 112  
Wells 7, 9, 10, 11,  
22, 31, 36 are  
within 4-mi radius  
of SP Oliver site. Only  
9, 10, 11 are currently used

| WELL      | OWNER   | LAT.   | LONG.  | SOURCE<br>OF<br>COORDS. | WATER<br>BEARING<br>UNIT | DEPTH<br>OF WELL<br>(FT.) | DATE<br>COM-<br>PLETED | WELL<br>TYPE | USE<br>OF<br>WATER | WATER<br>LEVEL<br>AVAIL. | WATER<br>QUAL.<br>AVAIL. |
|-----------|---|--------|--------|-------------------------|--------------------------|---------------------------|------------------------|--------------|--------------------|--------------------------|--------------------------|
| 65 15 101 | Tidwell Timbers MUD<br>Verde Forest             | 295101 | 951406 |                         | 121EVGL                  | 1272                      | 1971                   | W            | P                  | M                        | Y                        |
| 65 15 103 | (b) (6)   |        |        |                         |                          | 214                       | 1969                   | W            |                    | N                        | N                        |
| 65 15 106 | Greenwood Utility<br>District                   | 295116 | 951310 |                         | 121EVGL                  | 1195                      | 1970                   | W            | P                  | M                        | Y                        |
| 65 15 204 | Royal Wood MUD                                  | 295115 | 951115 | 5                       | 121EVGL                  | 812                       | 1962                   | W            | P                  | M                        | Y                        |
| 65 15 210 | Jackstone Subdivision                           | 295030 | 951039 |                         | 112CHCT                  | 397                       | 1980                   | W            | P                  | M                        | N                        |
| 65 15 211 | Parkway U.D.                                    | 295109 | 951207 |                         | 121EVGL                  | 1022                      | 1982                   | W            | P                  | M                        | N                        |
| 65 15 212 | Houston Cheers<br>Industrial Center             | 295038 | 951120 |                         | 112CHCT                  | 595                       | 1981                   | W            | P                  | M                        | N                        |
| 65 15 301 | Harris County FWS 48                            | 295115 | 950845 | 5                       | 112CEVG                  | 786                       | 1960                   | W            | P                  | M                        | Y                        |
| 65 15 304 | Southland Paper Mill                            | 295229 | 950741 |                         | 121EVGL                  | 1608                      | 1966                   | W            | N                  | C                        | Y                        |
| 65 15 306 | Arco Chem. Co.                                  | 295004 | 950735 | 1                       |                          | 1561                      | 09 1975                | W            |                    | N                        | N                        |
| 65 15 308 | Evans Cooperage                                 | 295205 | 950800 |                         | 112CHCT                  | 532                       | 1980                   | W            | N                  | M                        | N                        |
| 65 15 309 | Richmond Stimwell                               | 295218 | 950837 |                         | 112CHCT                  | 635                       | 1982                   | W            | P                  | M                        | N                        |
| 65 15 311 | NORTH STAR STEEL                                | 295035 | 950801 | 1                       | 112GLFC                  | 365                       | 1988                   | W            | N                  |                          |                          |
| 65 15 400 |   | 294958 | 951336 | 1                       | 112GLFC                  | 125                       | 1900                   | W            | T                  |                          |                          |
| 65 15 401 | Houston Lighting and<br>Power Co., Greens Bayou | 294919 | 951311 |                         | 121EVGL                  | 1489                      | 1947                   | W            | N                  | H                        | N                        |
| 65 15 402 | Houston Lighting and<br>Power, Greens Bayou     | 294932 | 951326 |                         | 121EVGL                  | 1548                      | 1947                   | W            | N                  | C                        | N                        |
| 65 15 403 | Houston Lighting and<br>Power Co, Greens Bayou  | 294902 | 951335 |                         | 121EVGL                  | 1429                      | 1948                   | W            | N                  | C                        | N                        |
| 65 15 404 | Houston Lighting and<br>Power co, Greens Bayou  | 294930 | 951254 |                         | 121EVGL                  | 1500                      | 1952                   | W            | N                  | C                        | N                        |
| 65 15 405 | Houston Lighting and<br>Power Co.               | 294929 | 951308 |                         | 112CHCTU                 | 135                       | 1938                   | W            | U                  | H                        | N                        |
| 65 15 406 | Houston Lighting and<br>Power co.               | 294929 | 951309 |                         | 121EVGL                  | 890                       | 1938                   | W            | U                  | H                        | N                        |
| 65 15 411 | City of Houston<br>Greens Bayou Estate          | 294804 | 951250 |                         | 112CHCT                  | 350                       | 1963                   | W            | U                  | H                        | Y                        |
| 65 15 412 | City of Houston<br>Maxey Estates                | 294753 | 951300 |                         | 112CHCTL                 | 332                       | 1962                   | W            | P                  | M                        | Y                        |
| 65 15 423 | Gulf Oil<br>Addres:                             | 294845 | 951345 | 7                       | 112CHCTL                 | 229                       | 1965                   | W            | N                  | M                        | Y                        |

07-001

**REFERENCE 8**

**Record of Communication To: Rudy Hodge, Water Engineer, City of Houston From: Ken Jensen,  
Fluor Daniel, Inc., Regarding City of Houston Water Supply, 5/30/95.**

**Date:** 30 May 95  
**Time:** 10:15 am PST

**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106

**To:** Rudy Hodge  
**Entity/Position:** Water Engineer - City of Houston  
**Phone #:** (713) 223-1095

**Relevant Information:**

Rudy gave the following information from the 1994 annual report of the City of Houston Water District:

Total 1994 pumpage: 123,704,270,000 gallons  
Groundwater: 53,763,036,000 gallons  
Surface Water: 69,930,236,000 gallons

Average pump rate per well at the Northeast station (total 7 wells) was 453,464,000 gallons per year (total for all wells 3,174,251,000 at Northeast cluster).

Average pump rate per well at the Heights station (total 9 wells) was 639,441,000 gallons per year (total for all wells 5,754,969,000 at Heights cluster).

There are 1.7 million people served by the Houston Water District.

Using these values, the following is calculated:

The annual population served by groundwater in Houston per year is 738,836.  
The number of persons on average served by each Northeast well is 6,232.  
The number of persons on average served by three Northeast wells is 18,695.

The number of persons on average served by each Heights well is 8,787.  
The number of persons on average served by three Heights wells is 26,362.

**Phone #:** (713) 223-1095

**Relevant Information:**

Rudy gave the following information from the 1994 annual report of the City of Houston Water District:

|                     |                         |
|---------------------|-------------------------|
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| Groundwater:        | 53,763,036,000 gallons  |
| Surface Water:      | 69,930,236,000 gallons  |

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Using these values, the following is calculated:

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The number of persons on average served by each Northeast well is 6,232.  
The number of persons on average served by three Northeast wells is 18,695.

The number of persons on average served by each Heights well is 8,787.  
The number of persons on average served by three Heights wells is 26,362.

**REFERENCE 9**

**U.S. Environmental Protection Agency. Final Rule Hazard Ranking System, FR 51532-51667,  
December 14, 1990.**

Final Rule

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Friday  
December 14, 1990

---

**Part II**

**Environmental  
Protection Agency**

---

**40 CFR Part 300**

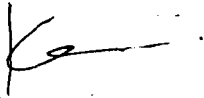
**Hazard Ranking System; Final Rule**

**REFERENCE 10**

**Record of Communication To: Tom Parker, Harris County Flood Control District, From: Ken Jensen, Fluor Daniel, Inc., Regarding Surface Water Usage in Areas Adjacent and Downstream of the S.P. Oliver Site, 6/02/95.**

**Date:** 08 June 95  
**Time:** 1:07 pm PST

**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106



**To:** Tom Parker  
**Entity/Position:** Harris County Flood Control District  
**Phone #:** (713) 684-4050

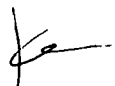
**Relevant Information:**

Tom stated that surface water and soils were not used as a resource within the 15-mile TSD of the S.P. Oliver site (sections of Hunting Bayou and Buffalo Bayou).



**REFERENCE 11**

**Record of Communication To: Dave Terry, Texas Natural Resources Conservation Commission,  
From: Ken Jensen, Fluor Daniel, Inc., Regarding Wellhead Protection Areas in vicinity of S.P.  
Oliver site.**

**Date:** 23 May 95  
**Time:** 8:45 am PST  
**Call From:** Dave Terry  
**Entity/Position:** Texas Natural Resources Conservation Commission (TNRCC)  
**Phone #:** (512) 239-4755 FAX 239-4760  
  
**To:** Ken Jensen  
**Entity/Position:** Fluor Daniel   
**Phone #:** (714) 975-2106

**Relevant Information:**

Dave called to confirm that the site does not exist within a wellhead protection area, nor is it located within 4 miles of a wellhead protection area.

**REFERENCE 12**

**Record of Communication To: Johnnie Kennedy, TNRCC, Houston District Office From: Ken Jensen, Fluor Daniel, Inc., Regarding Current Agency (TNRCC) Activities at the S.P. Oliver Site, 5/17/95.**

**Date:** 17 May 95  
**Time:** 8:50 am PST  
**Call From:** Johnnie Kennedy  
**Entity/Position:** Texas TNRCC  
**Phone #:** (713) 625-7304  
  
**To:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106

**Relevant Information:**

Johnnie called in response to a request for information on contaminant profile (types, levels, quantities of affected media) at the Wallisville Road site. The current TNRCC file ends at June, 1990; the most recent analytical report available was from 9/1/88, reflecting samples taken by Woodward-Clyde in August of 1988.

Main contaminants of concern at the site at 10s to 100s of ppm (mg/kg) were:

- Lindane
- Pentachloronitrobenzene
- 4,4'-DDT
- 4,4'-DDD
- 4,4'-DDE

Toxaphene was detected within site soils at levels over 1,000 ppm (mg/kg).

These levels have remained within site soils/sediments since the 1988 report was written; there is no record of the site having undergone remediation since the time of the Woodward-Clyde report.

There are unconfirmed reports of a surface removal action being performed in 1985/86 timeframe. No definitive file information has been found to date to substantiate this report.

TNRCC has undertaken a limited sampling of soils and sediments at the Wallisville road site; samples were taken in March/April 95 and are currently being processed through the State lab system.

No estimates of contaminant mass and/or affected soils volumes at the site have been found in the EPA or TNRCC files. Accordingly, preliminary estimates of volume will estimate contamination to 2 ft. over 25% of the site area and should be scaled back or increased if appropriate as more information is forthcoming.

**REFERENCE 13**

**Ecology and Environment, Inc., February 10, 1982. Memorandum from Imre Sekelyhidi, Environmental Engineer, E&E, Region VI; To: Dave Peters, Chief, Hazardous Wastes Section (Included in EPA File).**

Ecology and Environment, Inc.

Region VI

MEMORANDUM

TO: Dave Peters,  
Chief Hazardous Wastes Section

FROM: Imre Sekelyhidi, Environmental Engineer,  
E&E, Region VI

THRU: K. Malone, Jr., FITL *KBM*

DATE: February 10, 1982

SUBJ: Tasks Related to S.P. Oliver/Mustang/Seatrain (Old Olin) Site,  
Houston, TX, TDD #F-6-8112-22

*OLIN CORP - SP OLIVER  
TXD 000 602528*

In response to the subject TDD were performed the following interrelated tasks:

1. Review of "Draft Remedial Action Plan, Wallisville Road Site, Houston, Texas."

The plan was reviewed first within the framework of the December 15, 1981, meeting between site and EPA representatives, which Imre Sekelyhidi of our staff attended in accordance with TDD #F-6-8112-22, providing input in support of EPA observations concerning the plan.

The plan was also reviewed after the meeting, in preparation for the site visit, scheduled for January 13, 1982. Third, certain specific elements of the plan were discussed with site and state representatives at this meeting.

Attachment A briefly summarizes the result of the review.

2. Visit site with EPA and company representatives.

On the scheduled date weather conditions prevented the EPA representative from attending the meeting. As a consequence, E&E representatives, already in the area, were requested to attend the meeting, execute specific inspections accompanied by the participants and convey EPA directives to the participants. At the outset, as well as during the inspections E&E representatives, Imre Sekelyhidi and Debbie Vaughn made certain that their participation was not construed by the attendees to a representation of EPA, nor would any observations and statements made during the inspection be considered EPA positions, and the events which transpired would not obligate EPA in any way.

Attachment B briefly summarizes the results of the visit.

**REFERENCE 14**

**Roy F. Weston, Inc., 1985, Site Assessment Report on S.P. Oliver Pesticide Plant, Houston, Harris County, Texas, 10/21/85.  
(Included in EPA File)**

**WESTON • SPER**

*Cerelis # TX01538*  
DOCUMENT CONTROL NO. TAT-20-F-01633  
TDD NO. 6-8510-68

**SITE ASSESSMENT REPORT**

**ON**

*OLIV CORP - S P OLIVER  
TDD 000607028*

→ **S. P. OLIVER PESTICIDE PLANT**

**HOUSTON, HARRIS COUNTY, TEXAS**

**Prepared for**

**EPA - REGION VI  
EMERGENCY RESPONSE BRANCH**

**Gerald Fontenot,  
Deputy Project Officer**

**By**

**Roy F. Weston, Inc.  
Technical Assistance Team**

**DATE**

**October 21, 1985**

*Cerelis #  
TXD 000607028*



**REFERENCE 15**

**Facsimile Transmission From: Tom Michel, Data Processing Manager, Harris-Galveston Coastal  
Subsidence District To: Ken Jensen, Fluor Daniel, Inc., Regarding Registered Wells Located Within  
a 4-Mile Radius of the Site, 5/19/95.**

HARRIS - GALVESTON COASTAL SUBSIDENCE DISTRICT

1660 West Bay Area Blvd. Friendswood, Texas 77546 - 2640  
Phone (713) 486 - 1105 Fax (713) 488 - 6510

Fax Coversheet

To : KEN JENSEN

Company : FLUOR DANIEL  
12700 MERIT DR. SUITE 200  
DALLAS, TX. 75252

Phone # : (214) 450 - 4100 Fax # : (214) 450 - 4101

From : Tom Michel - Data Processing Manager

Phone # : (713) 486 - 1105 Fax # : (713) 488 - 6510

Operator : Susan Brown

Pages : 3 Including this cover page

PAGE.001

FROM H G COAST SUB DIST

MAY 19 '95 13:15

15-001

HARRIS - GALVESTON COASTAL SUBSIDENCE DISTRICT  
1660 WEST BAY AREA BOULEVARD  
FRIENDSWOOD, TX. 77546  
PHONE: (713) 486-1105  
FAX : (713) 488-6510

KEN JENSEN :

DUE TO THE LARGE VOLUME OF REQUESTS FOR WELL DATA, IT HAS BEEN NECESSARY TO  
STANDARDIZE OUR OUTPUT FORMAT.

THE ENCLOSED PRINTOUT, LISTS ALL SITES ON WHICH A WELL HAS BEEN PERMITTED BY  
THE DISTRICT WITHIN 4.00 MILES OF THE FOLLOWING POINT IN THE  
ORDER OF DISTANCE FROM THAT CENTER POINT, (I.E. CLOSEST TO FARTHEST):

LATITUDE 29 DEG 47 MIN 20 SEC  
LONGITUDE 95 DEG 17 MIN 20 SEC

PROJECT NO.:

PLEASE NOTE: IT IS POSSIBLE THAT SOME OF THESE SITES MAY NOT ACTUALLY HAVE A  
PRODUCING WELL ON THEM. WE DO NOT GUARANTEE THAT THESE ARE THE ONLY WELLS  
WITHIN THE RANGE SPECIFIED, ONLY THAT THESE ARE THE WELLS THAT ARE PERMITTED  
WITH THE DISTRICT WITHIN THIS RANGE. WE REGRET THAT WE CANNOT CUSTOMIZE OUR  
OUTPUT TO INDIVIDUAL SPECIFICATIONS AND HOPE THAT THE ENCLOSED LIST WILL  
SERVE YOUR NEEDS.

SINCERELY,

TOM MICHEL  
DATA PROCESSING MANAGER

HARRIS GALVESTON  
COASTAL SUBSIDENCE DISTRICT  
WELL RADIUS LISTING

| WELL<br>NUMBER | OWNERS NAME                     | LATITUDE | LONGITUDE | STATE # | DIST | ELEV | DIAM | DTFS | TOTAL<br>DEPTH | YEAR<br>DRILLED | APPROX. 93<br>PUMPAGE |
|----------------|---------------------------------|----------|-----------|---------|------|------|------|------|----------------|-----------------|-----------------------|
| 2568           | TEXAS PIPE LINE COMPANY         | 29-47-20 | 95-16-58  | 65-14-9 | 0.42 | 45   | 6    | 815  | 845            | 58              | 0                     |
| 1675           | PPG INDUSTRIES, INC.            | 29-47-46 | 95-17-57  | 65-14-5 | 0.86 | 46   | 16   | 850  | 1125           | 63              | 0                     |
| 2738           | (b) (6)                         | 29-48-12 | 95-17-38  | 65-14-5 | 1.04 | 40   | 4    | 350  | 702            | 54              | 0                     |
| 2996           | EXXON COMPANY, U.S.A.           | 29-48-17 | 95-17-4   | 65-14-6 | 1.12 | 45   | 2    | 0    | 0              | 83              | 0                     |
| 2595           | ALLIED FENCE CORPORATION        | 29-48-4  | 95-18-3   | 65-14-5 | 1.17 | 45   | 4    | 208  | 228            | 60              | 0                     |
| 2596           | ALLIED FENCE CORPORATION        | 29-48-4  | 95-18-3   | 65-14-5 | 1.17 | 45   | 4    | 210  | 230            | 63              | 0                     |
| 2918           | STAR ENTERPRISE                 | 29-47-47 | 95-16-21  | 65-14-6 | 1.23 | 40   | 4    | 0    | 230            | 89              | 0                     |
| 5279           | DELUTIS & BRASK                 | 29-48-21 | 95-18-3   | 64-14-5 | 1.41 | 45   | 4    | 60   | 200            | 62              | 0                     |
| 1967           | SOUTHERN PACIFIC TRANS. CO.     | 29-47-16 | 95-18-47  | 65-14-8 | 1.65 | 50   | 10   | 999  | 1200           | 81              | 0                     |
| 1968           | SOUTHERN PACIFIC TRANS. CO.     | 29-47-16 | 95-18-47  | 65-14-8 | 1.65 | 50   | 10   | 999  | 1200           | 54              | 0                     |
| 2751           | KEY OIL COMPANY                 | 29-48-46 | 95-17-4   | 65-14-6 | 1.66 | 50   | 4    | 0    | 0              | 83              | 0                     |
| 5259           | GULF COAST KENWORTH             | 29-48-33 | 95-18-10  | 65-14-5 | 1.68 | 45   | 4    | 0    | 250            | 88              | 0                     |
| 4427           | ROADWAY EXPRESS, INC.           | 29-47-36 | 95-15-45  | 65-14-6 | 1.82 | 40   | 4    | 282  | 302            | 81              | 0                     |
| 2247           | AMERICAN IND. LIFE INS. CO.     | 29-48-41 | 95-16-19  | 65-14-6 | 1.92 | 46   | 4    | 260  | 275            | 59              | 0                     |
| 1791           | CINTAS CORPORATION              | 29-45-53 | 95-18-22  | 65-14-8 | 2.02 | 0    | 6    | 347  | 434            | 63              | 0                     |
| 1990           | ANGELICA HEALTHCARE SERVICES    | 29-45-35 | 95-18-2   | 65-14-8 | 2.14 | 44   | 18   | 810  | 1005           | 65              | 12,000,000            |
| 2611           | BORDEN, INC. BAMA FOOD PRODUCTS | 29-45-51 | 95-18-50  | 65-14-8 | 2.40 | 41   | 8    | 0    | 595            | 58              | 0                     |
| 2612           | BORDEN, INC. BAMA FOOD PRODUCTS | 29-45-51 | 95-18-50  | 65-14-8 | 2.40 | 41   | 8    | 0    | 667            | 74              | 0                     |
| 4470           | WILLIAMS BROTHERS CONST. CO.    | 29-46-43 | 95-15-17  | 65-14-9 | 2.43 | 35   | 5    | 348  | 380            | 90              | 1,071,700             |
| 1711           | EXXON CHEMICAL COMPANY          | 29-45-12 | 95-16-45  | 65-14-9 | 2.51 | 35   | 10   | 635  | 701            | 47              | 36,700                |
| 2008           | MISSOURI PACIFIC RAILROAD CO.   | 29-49-33 | 95-17-26  | 65-14-6 | 2.52 | 50   | 16   | 769  | 887            | 64              | 0                     |
| 2246           | AMERICAN IND. LIFE INS. CO.     | 29-49-36 | 95-16-43  | 65-14-6 | 2.67 | 48   | 4    | 200  | 210            | 55              | 0                     |
| 1718           | COMET RICE MILLS, INC.          | 29-45-58 | 95-19-23  | 65-14-8 | 2.80 | 45   | 12   | 495  | 617            | 65              | 0                     |
| 1688           | GULF COAST PORTLAND CEMENT CO.  | 29-45-7  | 95-18-29  | 65-14-8 | 2.84 | 21   | 12   | 605  | 808            | 62              | 808,990               |
| 2752           | KEY OIL COMPANY                 | 29-48-47 | 95-15-13  | 65-14-6 | 2.92 | 45   | 4    | 407  | 422            | 67              | 0                     |
| 2032           | PARKER BROTHERS & CO., INC.     | 29-45-13 | 95-19-1   | 65-14-8 | 3.07 | 36   | 4    | 359  | 382            | 67              | 0                     |
| 1473           | JACINTO CITY, CITY OF           | 29-46-4  | 95-14-48  | 65-15-7 | 3.22 | 7    | 8    | 581  | 895            | 49              | 130,433,500           |

(1) →

15-003

PAGE .003

MAY 19 1955 13:16 FROM H G COAST SUB DIST

HARRIS GALVESTON  
COASTAL SUBSIDENCE DISTRICT  
WELL RADIUS LISTING

| WELL NUMBER | OWNERS NAME                     | LATITUDE | LONGITUDE | STATE # | DIST | ELEV | DIAM | DTFS | TOTAL DEPTH | YEAR DRILLED | APPROX. 93 PUMPAGE |
|-------------|---------------------------------|----------|-----------|---------|------|------|------|------|-------------|--------------|--------------------|
| 1084        | HOUSTON, CITY OF WL 01 →        | 29-47-43 | 95-20-10  | 65-14-4 | 3.25 | 50   | 24   | 999  | 1993        | 44           | 0                  |
| 2239        | TEX-TRUDE, INC.                 | 29-48-58 | 95-14-56  | 65-15-4 | 3.30 | 43   | 4    | 210  | 382         | 72           | 0                  |
| 1086        | HOUSTON, CITY OF WL 05 →        | 29-48-5  | 95-20-9   | 65-14-4 | 3.31 | 50   | 24   | 999  | 1980        | 49           | 372,465,625        |
| 1026        | HOUSTON, CITY OF CLAIRBORNE →   | 29-50-17 | 95-17-11  | 65-14-3 | 3.36 | 51   | 16   | 593  | 807         | 51           | 0                  |
| 1085        | HOUSTON, CITY OF WL 04 →        | 29-48-15 | 95-20-9   | 65-14-4 | 3.37 | 50   | 24   | 735  | 2080        | 49           | 372,465,625        |
| 1475        | JACINTO CITY, CITY OF           | 29-46-6  | 95-14-37  | 65-15-7 | 3.39 | 7    | 8    | 510  | 780         | 54           | 0                  |
| 1474        | JACINTO CITY, CITY OF (2) →     | 29-46-21 | 95-14-30  | 65-15-7 | 3.41 | 7    | 8    | 390  | 1006        | 59           | 130,433,500        |
| 2739        | (b) (6)                         | 29-48-57 | 95-14-48  | 65-15-4 | 3.42 | 45   | 4    | 400  | 0           | 74           | 0                  |
| 2478        | WEINGARTEN, INC., J.            | 29-45-4  | 95-19-19  | 65-14-8 | 3.42 | 40   | 6    | 814  | 905         | 57           | 0                  |
| 1709        | REED TOOL COMPANY               | 29-44-59 | 95-19-16  | 65-22-2 | 3.46 | 49   | 7    | 856  | 1115        | 41           | 0                  |
| 1951        | NATIONAL VINEGAR COMPANY        | 29-46-3  | 95-20-8   | 65-14-7 | 3.50 | 45   | 4    | 486  | 506         | 68           | 3,514,250          |
| 1952        | NATIONAL VINEGAR COMPANY        | 29-46-3  | 95-20-8   | 65-14-7 | 3.50 | 45   | 4    | 486  | 506         | 68           | 0                  |
| 4117        | NATIONAL VINEGAR COMPANY        | 29-46-3  | 95-20-8   | 65-14-7 | 3.50 | 40   | 5    | 300  | 350         | 90           | 3,514,250          |
| 1087        | HOUSTON, CITY OF WL 06 →        | 29-49-9  | 95-20-4   | 65-14-4 | 3.73 | 55   | 24   | 999  | 1839        | 49           | 372,465,625        |
| 2369        | PEOPLES NATIONAL UTILITY CO.    | 29-48-31 | 95-14-16  | 65-15-4 | 3.74 | 0    | 4    | 0    | 0           | 82           | 0                  |
| 1976        | SOUTHWEST FABRICATING & WELDING | 29-44-2  | 95-17-31  | 65-22-2 | 3.76 | 35   | 8    | 485  | 517         | 68           | 0                  |
| 2013        | DICKSON INDUSTRIAL DISTRICT     | 29-44-7  | 95-16-32  | 65-22-3 | 3.77 | 38   | 12   | 620  | 792         | 42           | 0                  |
| 2270        | GODDWILL INDUSTRIES OF HOUSTON  | 29-48-29 | 95-20-27  | 65-14-4 | 3.78 | 52   | 10   | 496  | 579         | 55           | 460,000            |
| 3993        | GODDWILL INDUSTRIES OF HOUSTON  | 29-48-29 | 95-20-27  | 65-14-4 | 3.78 | 52   | 5    | 500  | 540         | 90           | 460,000            |
| 2128        | SPARKLE ICE COMPANY             | 29-44-21 | 95-18-50  | 65-22-2 | 3.79 | 41   | 14   | 255  | 425         | 60           | 0                  |
| 2334        | FREEDMAN BROTHERS PACKING CO.   | 29-48-14 | 95-20-33  | 65-14-4 | 3.80 | 52   | 6    | 360  | 511         | 72           | 0                  |
| 1975        | SOUTHWEST FABRICATING & WELDING | 29-43-58 | 95-17-26  | 65-22-3 | 3.83 | 35   | 8    | 485  | 517         | 74           | 0                  |
| 1576        | GENERAL PORTLAND, INC.          | 29-45-23 | 95-20-5   | 65-14-7 | 3.83 | 50   | 14   | 500  | 612         | 51           | 0                  |
| 2794        | SOUTHERN BIBLE COLLEGE          | 29-49-5  | 95-14-20  | 65-15-4 | 3.95 | 40   | 8    | 520  | 585         | 49           | 0                  |
| 1088        | HOUSTON, CITY OF WL 07          | 29-49-33 | 95-20-1   | 65-14-4 | 3.96 | 61   | 24   | 999  | 1901        | 49           | 372,465,625        |

TOTAL 1993 PUMPAGE FOR THE WELLS ABOVE IS 1,772,595,390

15-004

\*\* TOTAL PAGE.004 \*\*

PAGE.004

FROM H G COAST SUB DIST

MAY 19 '95 13:17

#### **REFERENCE 16**

**Record of Communication To: Mark Leudke, Lance Robinson, TNRCC Fisheries Personnel  
Covering Galveston Bay From: Ken Jensen, Fluor Daniel, Inc., Regarding Recreational and  
Commercial Fishing Within Hunting Bayou and the Houston Ship Channel, 5/15/95.**

**Date:** 15 May 95  
**Time:** 9:20 am PST

**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106

**To:** Mark Leudke, Lance Robinson  
**Entity/Position:** TNRCC Fisheries personnel  
**Phone #:** ML:(713) 625-7690  
LR:(713) 474-2811

**Relevant Information:**

Both references indicated no data were available for commercial/recreational yields from waters adjacent to the site. Commercial fishing does not take place on Whiteoak Bayou, Hunting Bayou, or Buffalo Bayou, the water body by which the first two are drained into Galveston Bay.

**REFERENCE 17**

**Stennie Meadours, TNRCC, 1990. Memo to Ernest Heyer, Head, Program Services Unit, Field Operations Division, TNRCC (Texas Water Commission). Subject: "Olin/Texas Water Commission Settlement Agreement; Sample Analysis Results", 5/17/90  
(Included in EPA File).**



**TNRCC**Protecting Texas  
by Reducing and  
Preventing Pollution

# FAX TRANSMITTAL

DATE:

5/17/95

NUMBER OF PAGES (including this cover sheet):

7

TO: Name

Ken Jensen

Organization

Fugro

FAX Number

714-975-2260

FROM:

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Steve Hamm

Environmental Assessment Program

Region 12 - Houston

Phone: (713) 625-7305

Fax: (713)-625-7324

NOTES:

## Texas Water Commission

### INTEROFFICE MEMORANDUM

TO : FILE  
Ernest Heyer, Head, Program Services Unit  
THRU : Field Operations Division  
Stennie Meadours,  
FROM : Emergency Response Coordinator, SER  
SUBJECT: Olin/Texas Water Commission  
Settlement Agreement  
Sample Analysis Results

5-17-90  
DATE:

#### Background

The manufacture of toxaphene, DDT and other pesticides was conducted at the former Olin site at 7621 Wallisville, Houston during the early 1940's until sometime in the late 1970's or early 1980's. Concentrations of toxaphene and other pesticides in the DDT group were documented by 1980-81 by Environmental Protection Agency (EPA) analytical activities. Initially, EPA pursued enforcement of the subject site and performed an historical aerial photographic analysis of the Olin site. Several solid waste management units including surface impoundments and surface dumps were identified by the EPA study (Photographic analysis of the Olin Hazardous Waste Site Houston, Texas, EPA June 1981, copy in Deer Park office). Sometime around 1984, the EPA referred the Olin site to the Texas Department of Water Resources for enforcement action. On June 16, 1988 the Texas Water Commission and Olin signed a settlement agreement which resulted from lawsuit NO. 394,086, Olin Corporation V. The Texas Water Commission, The United States Environmental Protection Agency, Eureka Investment Company, Southern Pacific Transportation Company and Houston Belt and Terminal Railway Co, in the 299th Judicial District Court of Travis County, Texas.

#### Current Status

On or about August 12, 1988, Stennie Meadours of the Deer Park office was assigned as district representative to monitor the remedial activities resulting from the Olin Corporation/Texas Water Commission Settlement Agreement of June 16, 1988. This agreement described remedial actions to be conducted by Olin Corporation adjacent to their previously owned and operated site at 7621 Wallisville Road, Houston. Site visits and monitoring of sampling and remedial activities at the 7621 Wallisville site was conducted on the following dates by the listed district personnel:

File  
April 19, 1990  
Page 2

August 18, 22, 23, 24, and 26, 1988 - Stennie Meadours  
March 19, 1989 - Stennie Meadours  
April 20, 1989 - Stennie Meadours  
May 10, 1989 - Stennie Meadours, Glynnia Leiper  
May 16, 1989 - Eddie Elliot  
May 23, 1989 - Stennie Meadours  
June 9, 1989 - Stennie Meadours  
August 25, 1989 - Stennie Meadours, Eddie Elliot  
August 30, 1989 - Stennie Meadours, Ata Rahman and Mac Vilas

The documents and correspondence relevant to this report are attached and consist of the following:

Attachment 1: Attorney General correspondence dated June 16, 1988 conveying the TWC/Olin Settlement Agreement and describing the dates of compliance as November 1, 1988 sampling, excavation and backfilling deadline, December 15, 1988 as deadline for submission of the engineer's certificate. (To date the engineer's certificate has not been submitted to the Deer Park office.)

Attachment 2: Olin Corp.'s correspondence dated September 12, 1988 conveying Olin's Request for Proposal to perform the required work and acknowledging TWC concerns regarding the sampling that has already occurred.

Attachment 3: Olin Corp's correspondence dated November 8, 1988 conveying the analytical results\* of Olin's sample events which took place during August 23, 1988 thru August 29, 1988 and consisted of:

1. Four location along a line 20' south of Gloyd's residence running west. (As described in B.2 of investigation plan and identified in results as OG-1 thru OG-4.)
2. Seven locations on Gloyd property along the southern Gloyd property line. (As described in B.1 of investigation plan and identified in results as ED-1-B 2'-3' thru ED-7-C.)
3. Fifteen locations in ditch West of 7621 Wallisville site adjacent to Houston Belt and Terminals railway. (As described in A.1 and 2. of investigation plan and identified in results as ND-1-B thru ND-15A.)

File  
April 19, 1990  
Page 3

\*site drawing with sample locations identified included in this attachment by writer.

- Attachment 4: TWC, Deer Park office report dated February 10, 1989 conveying results of sample events that took place adjacent to the former Olin site and the Gloyd property on August 22, 23 and 26, 1988. Five samples of surface soils were collected and are identified by Chain of Custody Tag (COC) numbers.
- Attachment 5: TWC/Olin Technical Conference on February 15, 1989 where Olin stated proposed excavation to a depth of 3' with the exception of ND-2,4,6, where they planned to excavate to 4' and possibly deeper at ND 2 & 4. In regards to TWC sample results (COC SW 14838) indicating pesticide contamination of 20 ppm in an area not planned for remediation activities. Olin officials stated they did not contemplate excavation beyond that which will be proposed in forthcoming plan addressing the ED and ND areas described in the plan.
- Attachment 6: Olin Letters of Transmittal dated February 28, 1989 conveying the draft remediation plan promised by Olin during the February 15, 1989 technical conference.
- Attachment 7: TWC telephone memo dated March 29, 1989 documenting a conversation between Tim Chaney (TWC) and Verill Norwood (Olin) in which Tim Chaney expressed to Mr. Norwood that Olin activities and Remediation Plan to date did not conform to the investigation plan included in the Settlement Agreement. Areas where additional sampling was needed to determine the vertical extent of contamination were identified by Mr. Chaney.
- Attachment 8: Woodward-Clyde Consultants correspondence dated April 3, 1989 conveying a copy of the final remediation plan and expressing the incorporation of all Mr. Chaney's comments to Mr. Norwood.
- Attachment 9: Attorney General's correspondence dated April 14, 1989 regarding Ms. Gloyd's release authorizing access to and sampling activities on her property and authorizing the use of a power driven augur in certain sampling points.

File  
April 19, 1990  
Page 4

Attachment 10: Tim Chaney (TWC) telephone memo documenting a conversation with Brian Barwick concerning notification of the SER Office prior to sampling or excavation work.

Attachment 11: Attorney General's faxed copy dated May 25, 1989 an unsigned version of the Release and Access Agreement prepared for Ms. Opel Gloyd's signature.

Attachment 12: TWC Service Request dated May 23, 1989 in which Ms. Opel Gloyd requests:

- Information regarding Wallisville/Olin site remedial work
- Analysis results of samples collected on the Gloyd property and a TWC citizens request for assistance requesting soil sample collection and analyses on the Gloyd property.

Attachment 13: TWC Woodward-Clyde Consultants correspondence dated May 25, 1989 recommending a layer of stone approximately 10 to 12 inches be placed in the excavated ditch provided that it is underlain by 3 feet of clay backfill. In addition, the correspondence states that the caliche used as a road bed for the Wallisville excavations is considered adequate for use as a cover for the clay.

Attachment 14: Photographs (to be included under separate cover).

As requested by Mrs. Gloyd on May 23, 1989, on August 25, and 30 1989, eleven soil samples were collected in Mrs. Gloyd's yard adjacent to the area remediated. The samples were analyzed for pesticides, toxaphene and BHC (lindane). The results of the sample analysis are shown in the table entitled Olin/Gloyd Analyses Results and a map of sample locations is attached to the table.

#### Action Requested

This incident of a documented release of a toxic pesticide is being referred to the TWC hazardous waste screening committee for evaluation and a recommended course of action. Three possible actions which may be considered are:

1. Require additional investigative and remedial actions of Olin Corp.

File  
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Page 5

Olin/Gloyd Analyses Results

Chain of  
Custody

Tag # SW02637 SW02638 SW02639 SW02640 SW02641 SW02642 SW02643 SW02644 SW02645 SW02646 SW02647

Date 8-25-89 8-25-89 8-25-89 8-25-89 8-30-89 8-30-89 8-30-89 8-30-89 8-30-89 8-30-89 8-30-89

Location\*\*

Sample # #1 #2 #3 #4 #5 #6 #7 #8 #9 #10 #11

Chemical

|           |        |        |        |        |        |        |        |        |        |        |        |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Toxaphene | *      | *      | 8.2    | 49.5   | 21.0   | 1.3    | *      | 0.6    | 156.0  | 0.4    | <0.05  |
| Deildrin  | 0.005  | 0.06   | 0.003  | --     | 0.03   | 0.004  | 0.01   | --     | --     | 0.003  | --     |
| Lindane   | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Chlordane | --     | --     | --     | --     | --     | --     | --     | --     | --     | --     | 0.02   |
| PP'DDE    | 0.08   | 1.0    | .06    | 1.6    | 0.1    | --     | 0.13   | --     | --     | 0.09   | --     |
| PPDDT     | 0.07   | 2.0    | --     | --     | --     | --     | 0.09   | --     | --     | --     | 0.15   |
| OP'DDT    | --     | --     | --     | --     | --     | --     | --     | --     | --     | --     | --     |

All units in ppm.

Chain of Custody Tags are attached.

\*Unable to detect due to high background interference.

\*\*Sample location map attached.

File  
April 19, 1990  
Page 6

2. Execute a state funded emergency action from either the Texas Spill Response Fund or the Hazardous Waste Disposal Fee Fund.
3. Consider the source of the contamination, the former pesticide manufacturing site, for ranking on the National Priorities List. (To date this office is unaware of any investigations conducted at the manufacturing site.)

Signed:

Stennie A. Meadours  
Stennie A. Meadours  
Emergency Response Coordinator  
Hazardous and Solid Waste  
Southeast Region

SM/ja

↑  
Now in Austin  
(512) 339-3905

FLUOR DANIEL 

17-007

**REFERENCE 18**

**Record of Communication To: Shannon Breslin, Texas Natural Heritage Program - Resource Protection Division. From: Ken Jensen, Fluor Daniel, Inc., Regarding Endangered Species Within the TDL of the S.P. Oliver Site, 5/23/95.**



**Date:** 23 May 95  
**Time:** 11:55 am PST

**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106



**To:** Shannon Breslin  
**Entity/Position:** Graduate Student/Employee Texas Natural Heritage Program -  
Resource Protection Division  
**Phone #:** (512) 912-7021

**Relevant Information:**

Shannon looked at endangered species both at the site and for 15 miles downstream of the site. She came up with three species which could conceivably use this area as habitat, although she described the likelihood of finding these species as "very unlikely". The species were:

|                        |                  |
|------------------------|------------------|
| Prairie Dawn           | flowering annual |
| Texas Windmill Grass   | grass species    |
| Houston Machaeranthera | grass species    |

**REFERENCE 19**

**U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory maps:  
Settegast, TX; Jacinto City, TX; Park Place, TX; Pasadena, TX.**

SETTEGAST, TEX.



**U.S. DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE**

Prepared by Office of Biological Services

for the National Wetlands Inventory  
and the National Coastal Ecosystems Team

Sponsored by the Minerals Management Service

U.S. Department of the Interior

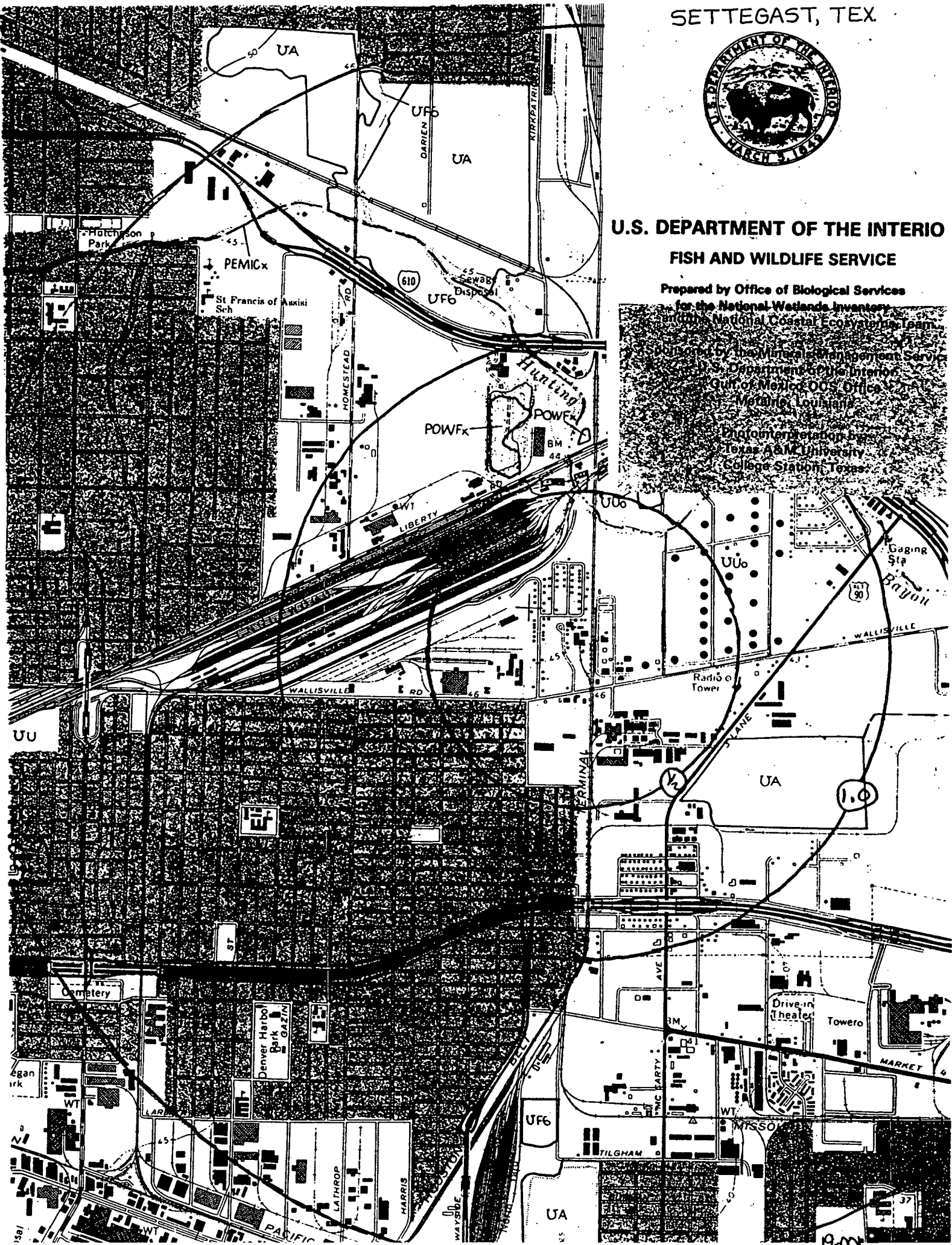
Gulf of Mexico OCS Office

Metairie, Louisiana

Photointerpretation by

Texas A&M University

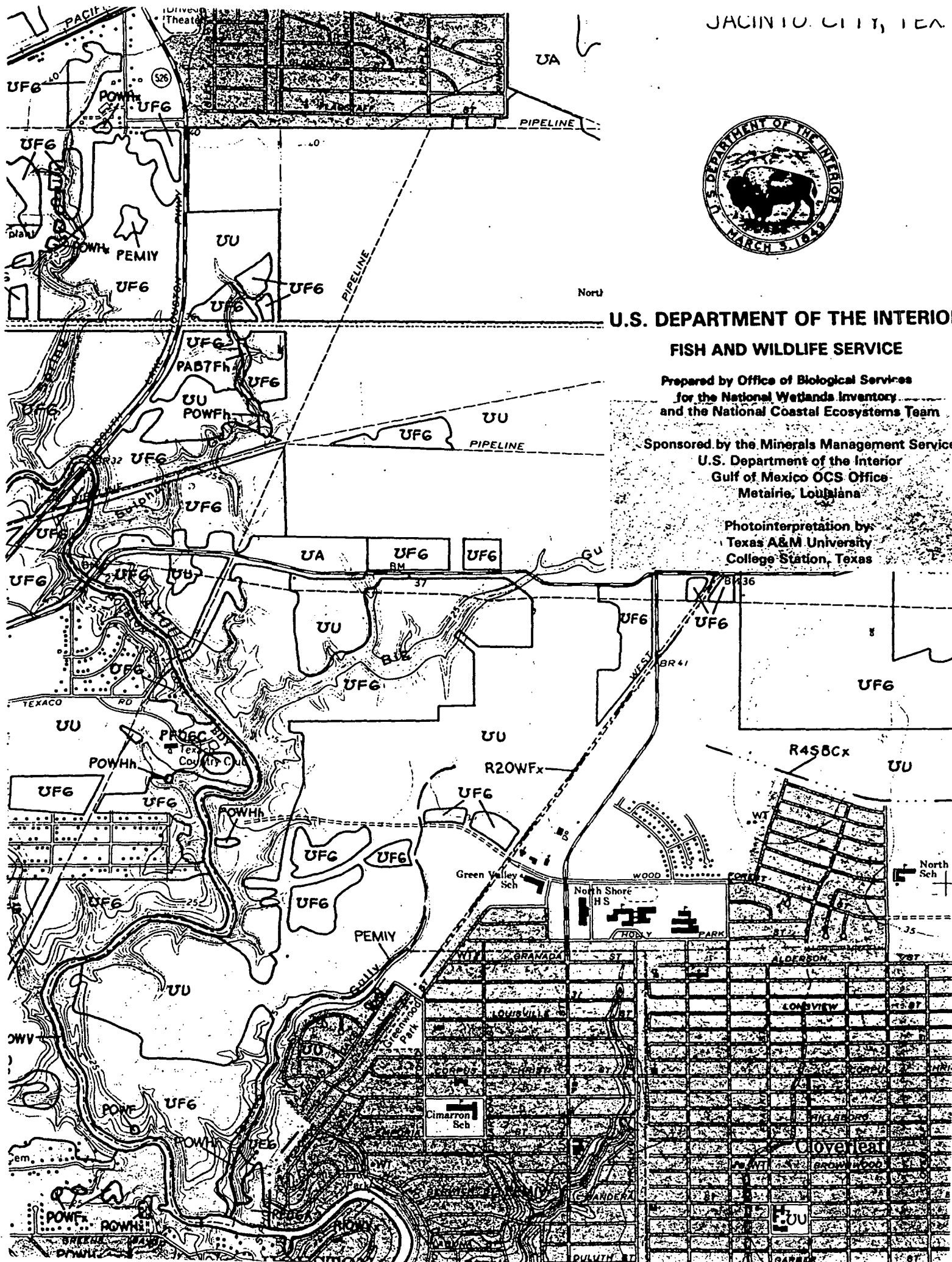
College Station, Texas



Prepared by Office of Biological Services  
for the National Wetlands Inventory  
and the National Coastal Ecosystems Team

Sponsored by the Minerals Management Service  
U.S. Department of the Interior  
Gulf of Mexico OCS Office  
Metairie, Louisiana

Photointerpretation by:  
Texas A&M University  
College Station, Texas



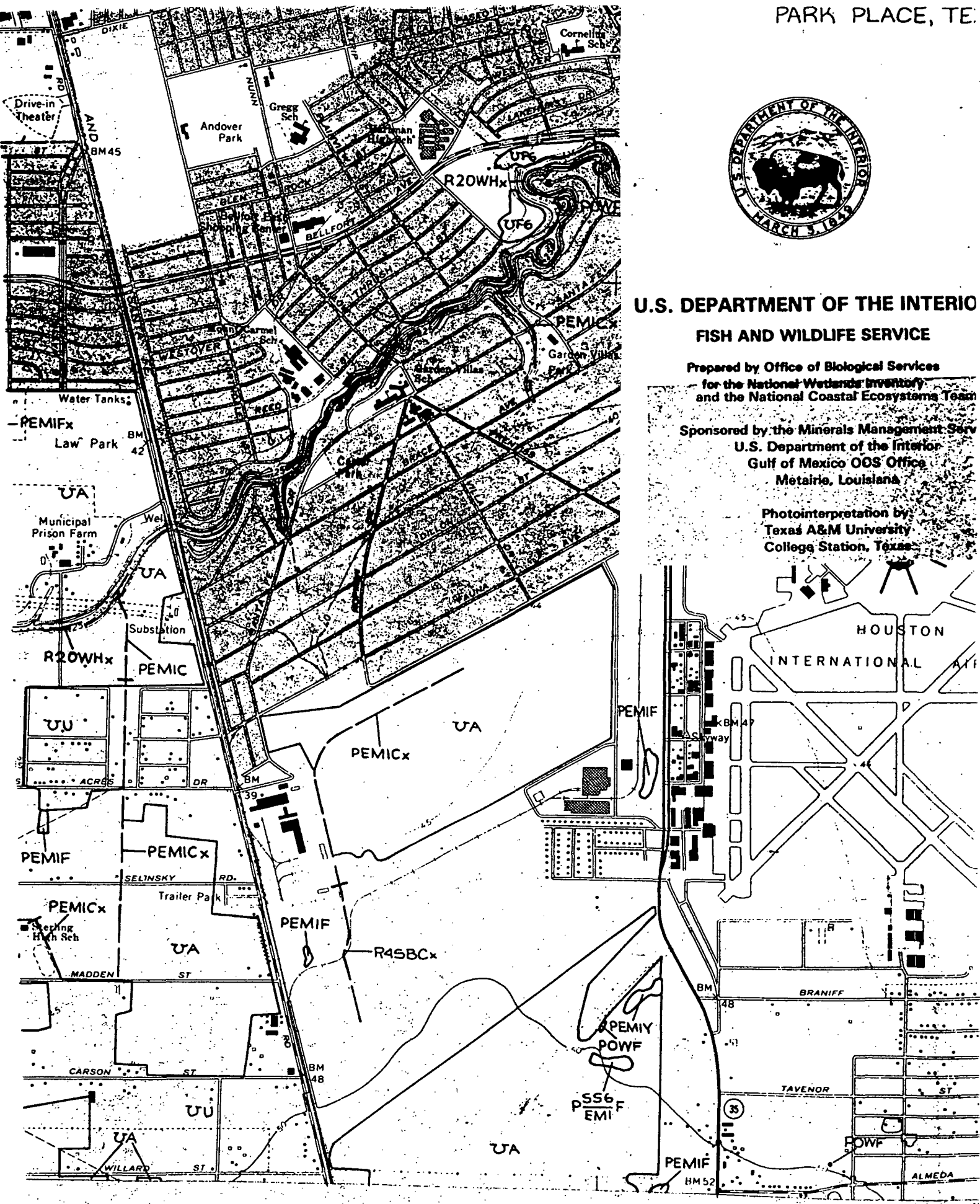


**U.S. DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE**

Prepared by Office of Biological Services  
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Sponsored by the Minerals Management Serv  
U.S. Department of the Interior  
Gulf of Mexico OOS Office  
Metairie, Louisiana

Photointerpretation by  
Texas A&M University  
College Station, Texas



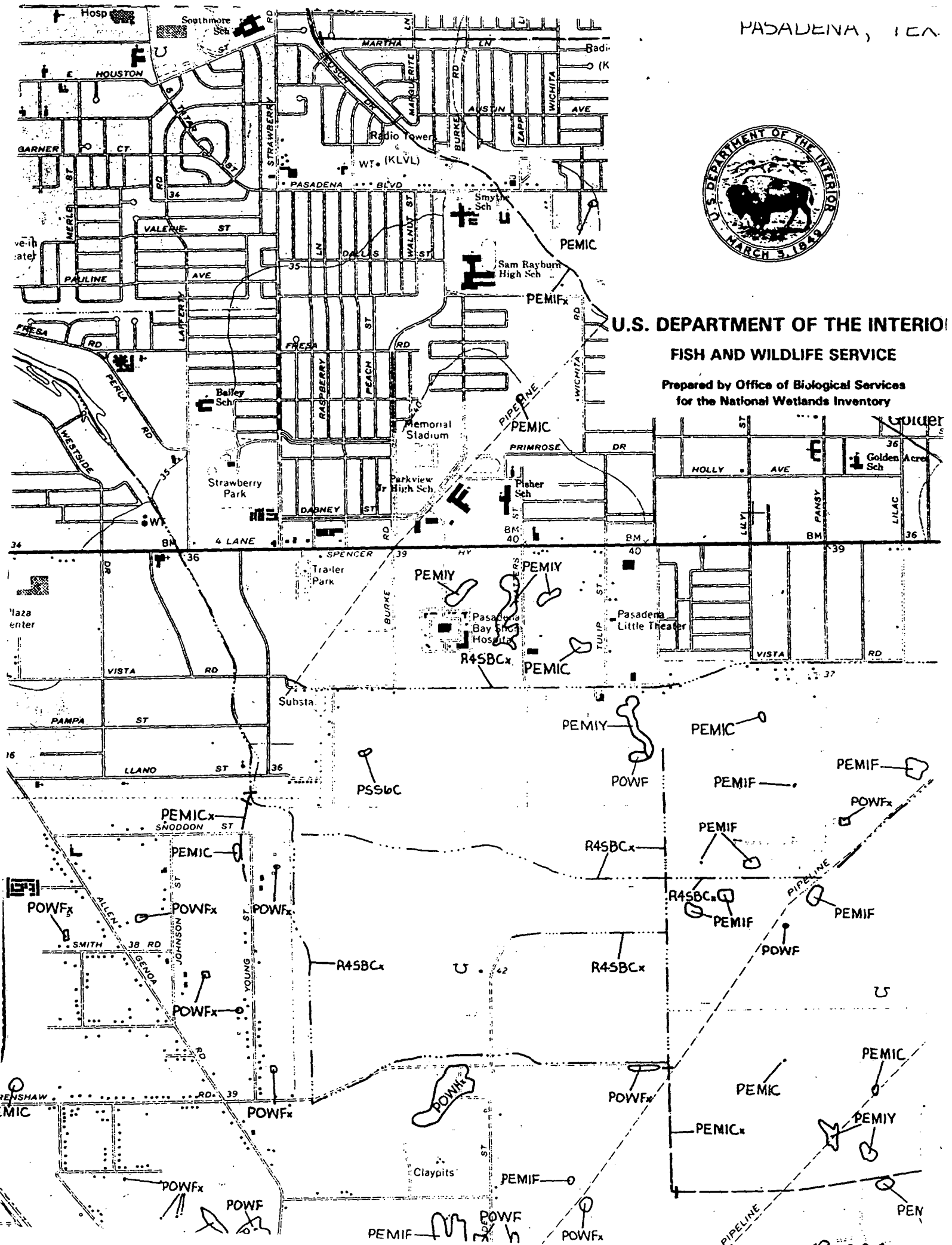
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U.S. DEPARTMENT OF THE INTERIOR

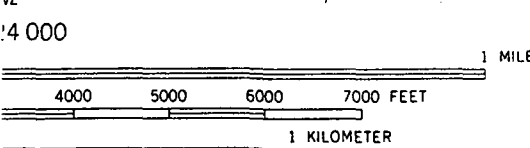
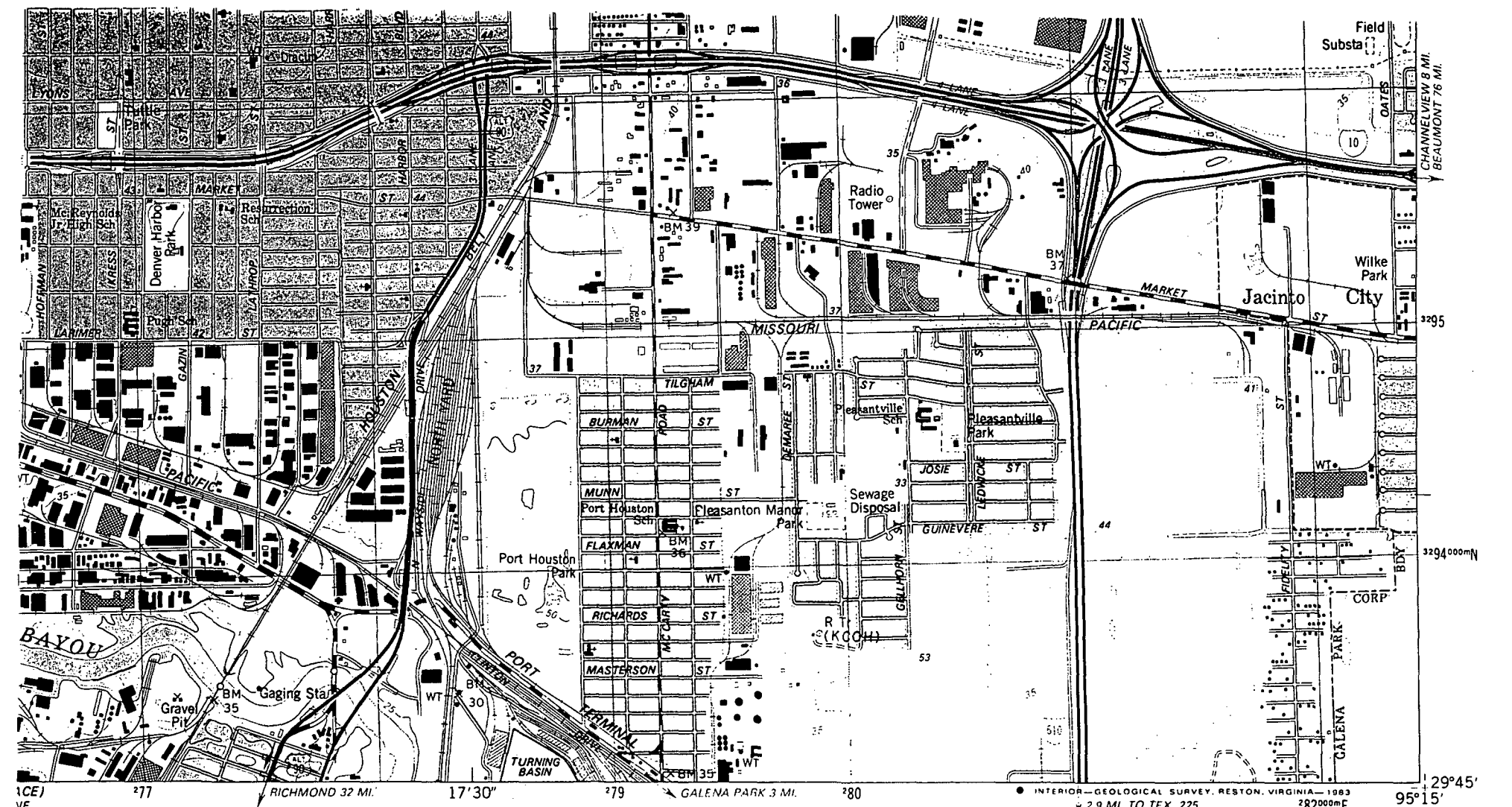
FISH AND WILDLIFE SERVICE

Prepared by Office of Biological Services  
for the National Wetlands Inventory



**REFERENCE 20**

**U.S. Geological Survey, 7.5-minute topographic maps: Settegast (1982), Jacinto City (1982), Park Place (1982) and Pasadena (1983), Texas.**



VAL 5. FEET  
ICAL DATUM OF 1929

**MAPSCO, INC.**  
6118 CAMP BOWIE  
FORT WORTH, 76116 817/731-1666



QUADRANGLE LOCATION

ROAD CLASSIFICATION

|                                    |  |
|------------------------------------|--|
| Primary highway,<br>hard surface   | Light-duty road, hard or<br>improved surface |
| Secondary highway,<br>hard surface | Unimproved road                              |
| Interstate Route                   | U. S. Route                                  |
|                                    | State Route                                  |

**SETTEGAST, TEX.**  
N2945-W9515/7.5

1982

DMA 6943 IV SE-SERIES V882

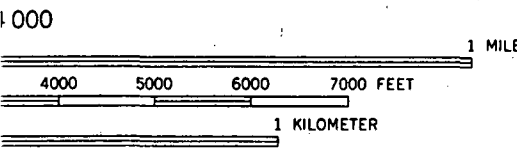
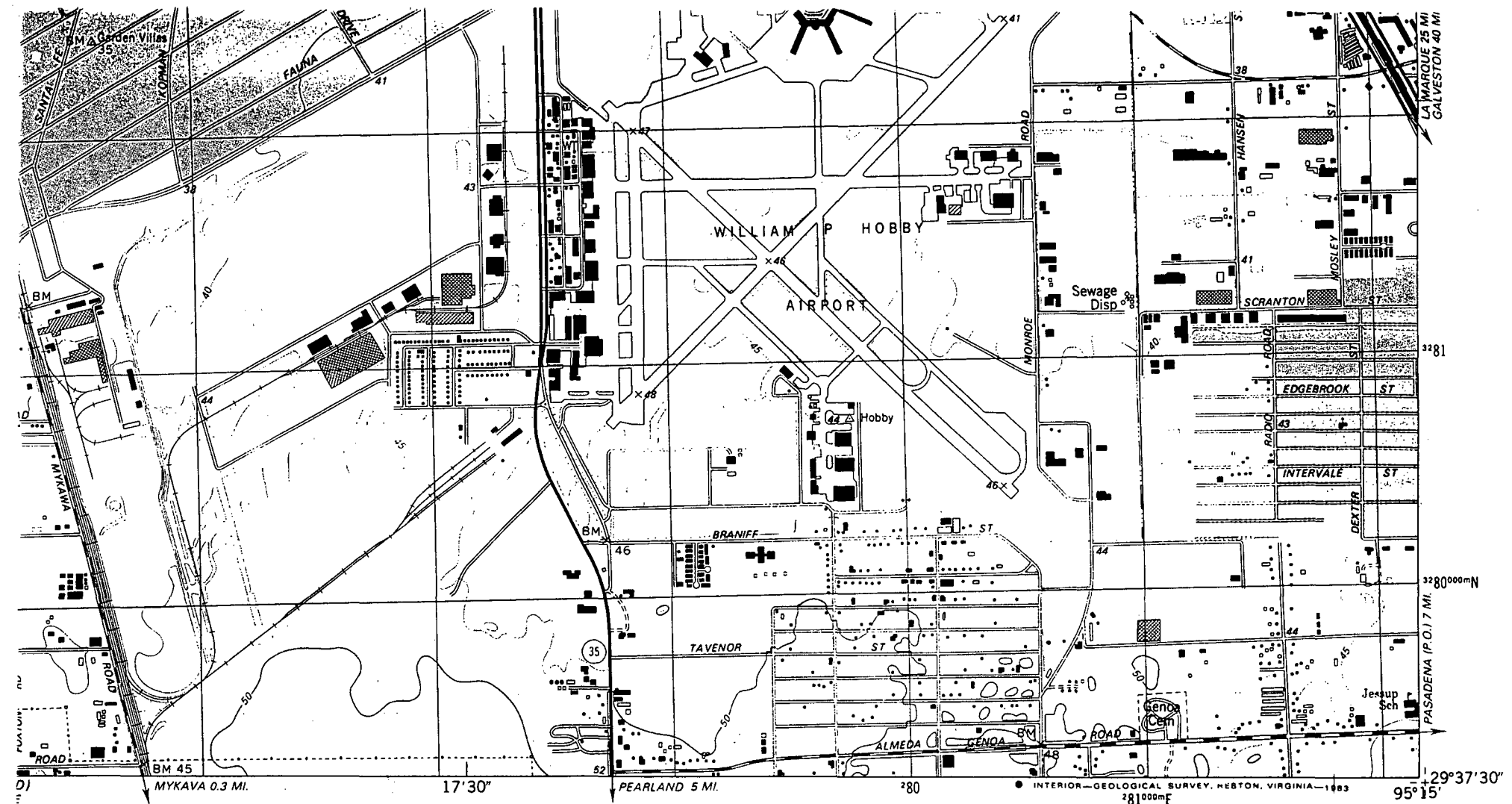
2995-431

IL MAP ACCURACY STANDARDS  
COLORADO 80225, OR RESTON, VIRGINIA 22092  
ND SYMBOLS IS AVAILABLE ON REQUEST

20-001







Vertical Datum of 1929  
 State Low Water Datum  
 Climate Line of Mean High Water  
 E is Negligible

Map Accuracy Standards  
 Colorado 80225, or Reston, Virginia 22092  
 Symbols is Available on Request



QUADRANGLE LOCATION

| ROAD CLASSIFICATION             |   |
|---------------------------------|---|
| Primary highway, hard surface   | Light-duty road, hard or improved surface |
| Secondary highway, hard surface | Unimproved road                           |
| Interstate Route                | U. S. Route ( ) State Route               |

PARK PLACE, TEX.  
 N2937.5-W9515/7.5

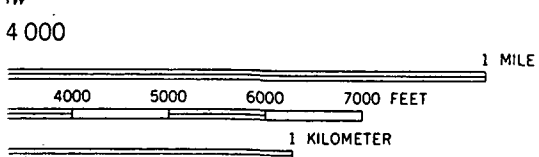
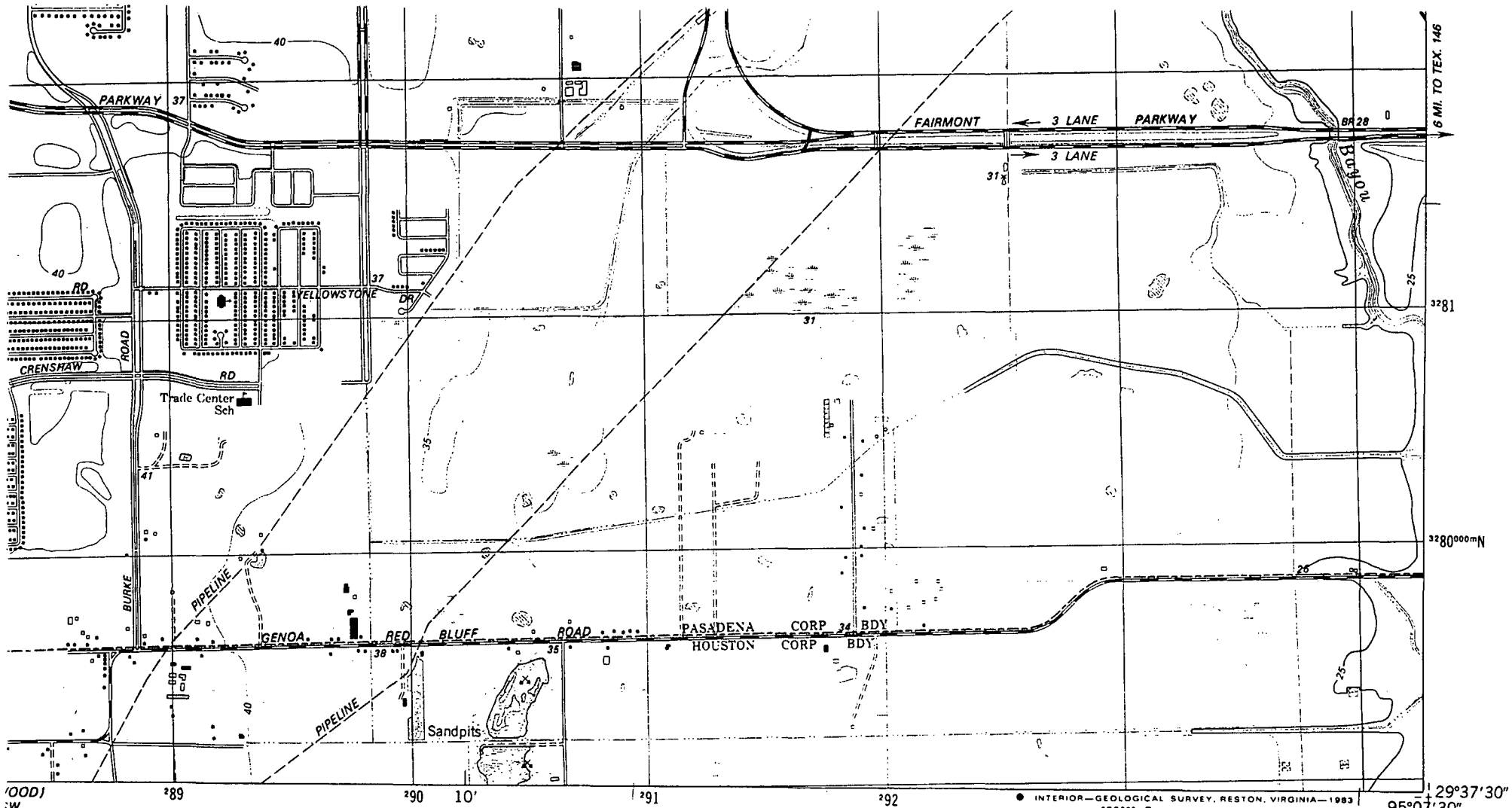
1982

DMA 6943 III NE-SERIES V882

MAPSCO, INC.  
 6110 CAMP BOWIE  
 FORT WORTH, TEXAS 76116 817/731-1666

2995-424

2003



VAL 5 FEET  
ICAL DATUM OF 1929  
AST LOW WATER DATUM  
XIMATE LINE OF MEAN HIGH WATER  
DE IS NEGLIGIBLE

MAP ACCURACY STANDARDS  
COLORADO 80225, OR RESTON, VIRGINIA 22092  
ID SYMBOLS IS AVAILABLE ON REQUEST



QUADRANGLE LOCATION

2995-413

ROAD CLASSIFICATION

- |                                    |  |
|------------------------------------|--|
| Primary highway,<br>hard surface   | Light-duty road, hard or<br>improved surface |
| Secondary highway,<br>hard surface | Unimproved road                              |
| Interstate Route                   | U. S. Route                                  |
|                                    | State Route                                  |

MAPSCO, INC.  
6118 CAMP BOWIE  
FORT WORTH, 76116 817/731-1666

PASADENA, TEX.  
N2937.5-W9507.5/7.5

1982

DMA 6943 II NW-SERIES V882

6943 II SE  
LEAGUE  
CITY

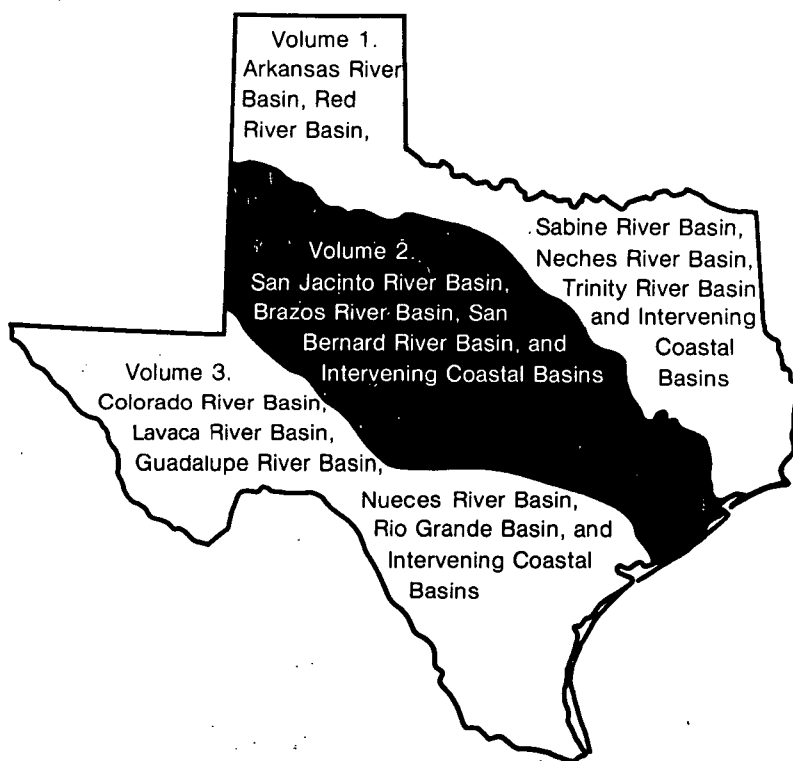
**REFERENCE 21**

**Texas Water Resources Data, Water Year 1991, Volume 2. San Jacinto River Basin, Brazos River Basin, San Bernard River Basin, and Intervening Coastal Basins. U.S. Geological Survey Report TX-91-2.**



# Water Resources Data Texas Water Year 1991

Volume 2. San Jacinto River Basin, Brazos River Basin,  
San Bernard River Basin, and Intervening  
Coastal Basins



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT TX-91-2  
Prepared in cooperation with the State of Texas  
and with other agencies

## 08075770 HUNTING BAYOU AT INTERSTATE HIGHWAY 610, HOUSTON, TX

LOCATION.--Lat 29°47'35", long 95°16'04", Harris County, Hydrologic Unit 12040104, on left bank at downstream side of downstream service road bridge of Interstate Highway 610 in northeast Houston and 8.8 mi upstream from mouth.

DRAINAGE AREA.--16.1 mi<sup>2</sup>. Prior to Oct. 1, 1973, 16.8 mi<sup>2</sup>. Oct. 1, 1973, to Sept. 30, 1978, 14.7 mi<sup>2</sup>. Oct. 1, 1978, to Sept. 30, 1987, 15.8 mi<sup>2</sup>. Changes due to storm sewer relocations and addition or relocation of ditches.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1964 to current year. Prior to October 1973, published as "U.S. Highway 90-A, Houston".

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is National Geodetic Vertical Datum of 1929, 1959 adjustment; unadjusted for land-surface subsidence. Prior to Oct. 1, 1972, water-stage recorder at site 1,800 ft upstream at same datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Low flow is largely maintained by sewage and industrial effluent. The stage-discharge relationship is affected by seasonal vegetal growth during most years. Recording rain gage at station. Stage and rainfall radio-telemeter at station, is operated by the Harris County Flood Control District.

AVERAGE DISCHARGE.--27 years, 23.6 ft<sup>3</sup>/s (17,100 acre-ft/yr). †

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,470 ft<sup>3</sup>/s June 26, 1989 (elevation, 39.91 ft); minimum daily discharge, 0.88 ft<sup>3</sup>/s Aug. 24, 1971.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,000 ft<sup>3</sup>/s and maximum (\*):

| Date    | Time | Discharge (ft <sup>3</sup> /s) | Elevation (ft) | Date    | Time | Discharge (ft <sup>3</sup> /s) | Elevation (ft) |
|---------|------|--------------------------------|----------------|---------|------|--------------------------------|----------------|
| Jan. 10 | 1130 | 1,530                          | 33.23          | Apr. 5  | 1700 | 1,630                          | 33.64          |
| Jan. 15 | 0130 | *1,900                         | *34.75         | Apr. 14 | 1800 | 1,290                          | 32.16          |
| Jan. 18 | 1330 | 1,070                          | 31.05          | June 15 | 1300 | 1,070                          | 31.07          |

Minimum daily discharge, 3.4 ft<sup>3</sup>/s Oct. 16, 31.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991  
DAILY MEAN VALUES

| DAY   | OCT   | NOV   | DEC   | JAN    | FEB    | MAR   | APR    | MAY   | JUN    | JUL   | AUG   | SEP   |
|-------|-------|-------|-------|--------|--------|-------|--------|-------|--------|-------|-------|-------|
| 1     | 3.6   | 3.5   | 5.6   | 8.4    | 11     | 76    | 7.0    | 5.5   | 4.7    | 8.3   | 11    | 27    |
| 2     | 3.8   | 4.4   | 5.2   | 185    | 11     | 20    | 6.1    | 7.0   | 4.2    | 8.8   | 5.6   | 44    |
| 3     | 5.1   | 12    | 4.9   | 202    | 10     | 13    | 5.7    | 5.1   | 7.6    | 14    | 5.4   | 34    |
| 4     | 13    | 11    | 4.9   | 24     | 382    | 11    | 167    | 5.3   | 12     | 33    | 5.4   | 11    |
| 5     | 17    | 8.7   | 4.7   | 15     | 164    | 11    | 731    | 4.9   | 4.5    | 13    | 7.1   | 42    |
| 6     | 8.7   | 4.6   | 7.1   | 53     | 34     | 9.7   | 209    | 4.4   | 4.0    | 8.6   | 5.8   | 104   |
| 7     | 10    | 4.0   | 14    | 24     | 20     | 9.6   | 33     | 4.8   | 28     | 8.8   | 25    | 66    |
| 8     | 4.6   | 75    | 7.0   | 14     | 16     | 8.5   | 16     | 19    | 70     | 7.0   | 14    | 39    |
| 9     | 18    | 140   | 10    | 90     | 15     | 7.6   | 12     | 13    | 51     | 6.4   | 7.0   | 9.2   |
| 10    | 11    | 14    | 7.3   | 650    | 14     | 7.4   | 10     | 5.9   | 29     | 6.4   | 5.6   | 8.1   |
| 11    | 5.8   | 8.4   | 5.6   | 85     | 13     | 7.4   | 117    | 5.6   | 24     | 6.3   | 5.5   | 6.7   |
| 12    | 4.2   | 6.9   | 5.0   | 26     | 12     | 7.7   | 34     | 4.9   | 39     | 5.9   | 5.8   | 67    |
| 13    | 3.9   | 6.2   | 4.9   | 18     | 12     | 6.9   | 17     | 4.6   | 10     | 5.8   | 6.0   | 83    |
| 14    | 3.8   | 5.3   | 5.1   | 121    | 11     | 6.8   | 454    | 4.8   | 13     | 5.7   | 8.8   | 25    |
| 15    | 3.7   | 5.0   | 4.9   | 730    | 10     | 24    | 186    | 40    | 407    | 5.8   | 13    | 8.2   |
| 16    | 3.4   | 5.0   | 4.7   | 53     | 9.8    | 57    | 35     | 32    | 74     | 5.5   | 60    | 7.4   |
| 17    | 96    | 4.7   | 4.9   | 25     | 11     | 36    | 61     | 22    | 82     | 5.4   | 16    | 6.2   |
| 18    | 52    | 4.8   | 10    | 434    | 11     | 14    | 165    | 11    | 38     | 7.0   | 8.8   | 11    |
| 19    | 7.2   | 5.0   | 5.6   | 117    | 31     | 9.6   | 26     | 11    | 27     | 11    | 20    | 8.6   |
| 20    | 5.0   | 4.9   | 5.1   | 32     | 13     | 8.4   | 14     | 9.8   | 18     | 6.1   | 6.0   | 5.6   |
| 21    | 92    | 4.9   | 9.1   | 20     | 282    | 8.8   | 9.9    | 9.0   | 22     | 5.7   | 5.2   | 5.4   |
| 22    | 35    | 17    | 7.1   | 19     | 57     | 7.9   | 8.7    | 13    | 19     | 5.8   | 9.9   | 6.5   |
| 23    | 8.0   | 17    | 6.1   | 15     | 21     | 7.3   | 7.8    | 14    | 15     | 5.2   | 5.5   | 5.2   |
| 24    | 5.4   | 8.0   | 5.7   | 24     | 15     | 7.1   | 7.0    | 6.5   | e14    | 6.4   | 6.4   | 9.2   |
| 25    | 4.5   | 6.8   | 6.3   | 16     | 19     | 6.7   | 6.9    | 5.9   | e27    | 11    | 4.6   | 18    |
| 26    | 4.1   | 6.7   | 47    | 14     | 15     | 6.6   | 6.4    | 4.9   | e43    | 7.7   | 4.0   | 5.6   |
| 27    | 3.8   | 8.8   | 95    | 14     | 12     | 6.3   | 6.6    | 4.7   | 47     | 5.5   | 3.6   | 4.8   |
| 28    | 3.8   | 6.2   | 13    | 13     | 20     | 8.8   | 6.0    | 4.5   | 16     | 5.0   | 3.7   | 4.5   |
| 29    | 3.6   | 4.9   | 9.6   | 13     | ---    | 33    | 5.6    | 43    | 14     | 21    | 3.5   | 6.8   |
| 30    | 3.5   | 4.8   | 8.4   | 13     | ---    | 8.2   | 5.0    | 15    | 9.5    | 17    | 3.6   | 5.7   |
| 31    | 3.4   | ---   | 8.2   | 13     | ---    | 6.8   | ---    | 6.4   | ---    | 5.8   | 5.6   | ---   |
| TOTAL | 446.9 | 418.5 | 342.0 | 3080.4 | 1251.8 | 459.1 | 2375.7 | 347.5 | 1173.5 | 274.9 | 297.4 | 664.7 |
| MEAN  | 14.4  | 13.9  | 11.0  | 99.4   | 44.7   | 14.8  | 79.2   | 11.2  | 39.1   | 8.87  | 9.59  | 22.2  |
| MAX   | 96    | 140   | 95    | 730    | 382    | 76    | 731    | 43    | 407    | 33    | 60    | 104   |
| MIN   | 3.4   | 3.5   | 4.7   | 8.4    | 9.8    | 6.3   | 5.0    | 4.4   | 4.0    | 5.0   | 3.5   | 4.5   |
| AC-FT | 886   | 830   | 678   | 6110   | 2480   | 911   | 4710   | 689   | 2330   | 545   | 590   | 1320  |

CAL YR 1990 TOTAL 6152.3 MEAN 16.9 MAX 253 MIN 2.3 AC-FT 12200  
WTR YR 1991 TOTAL 11132.4 MEAN 30.5 MAX 731 MIN 3.4 AC-FT 22080

e Estimated

08074000 BUFFALO BAYOU AT HOUSTON, TX

LOCATION.--Lat 29°45'36", long 95°24'30", Harris County, Hydrologic Unit 12040104, on right bank at downstream side of bridge on Shepherd Drive in Houston and 0.8 mi upstream from Waugh Drive.

DRAINAGE AREA.--358 mi<sup>2</sup>, unadjusted for basin boundary changes.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1936 to September 1957, October 1957 to December 1961 (high-water records and discharge measurements), January 1962 to September 1975, October 1975 to current year (high-water records and discharge measurements).

REVISED RECORDS.--WSP 1732: Drainage area (former site).

GAGE.--Water-stage recorder and crest-stage gages. Datum of gage is 1.36 ft below National Geodetic Vertical Datum of 1929, 1973 adjustment; records unadjusted for land-surface subsidence. Prior to June 19, 1936, nonrecording gage, and June 19, 1936, to Jan. 16, 1962, water-stage recorder at site 0.8 mi downstream at 4.08-foot lower datum. Jan. 17, 1962, to Sept. 30, 1973, auxiliary water-stage recorder 0.8 mi downstream. Water-stage recorder at Main Street (station 08074600) used as auxiliary gage after Sept. 30, 1973.

REMARKS.--Records fair. Although floodflows are regulated by Barker and Addicks Reservoirs (stations 08072500 and 08073000) located 26.3 and 26.8 mi upstream, respectively, flood peaks from the urbanized areas below these reservoirs are often independent of the regulation. Discharge is computed using a stage-fall-discharge relationship for all storms that produce peak discharges above 2,000 ft<sup>3</sup>/s. Discharges below 1,000 ft<sup>3</sup>/s are computed or estimated following designated storm periods only. Low flow is mostly sustained by sewage effluent from Houston suburbs. Gage heights are affected by tides, backwater from Whiteoak Bayou, and other streams. Gage-height telemeter at station.

AVERAGE DISCHARGE.--8 years (water years 1936-44) unregulated, 272 ft<sup>3</sup>/s (197,100 acre-ft/yr); 26 years (water years 1944-57, 1962-75) regulated, 274 ft<sup>3</sup>/s (198,500 acre-ft/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,900 ft<sup>3</sup>/s Aug. 30, 1945 (gage height, 28.82 ft), at site 0.8 mi downstream at present datum; maximum gage height, 30.00 ft May 18, 1989, at current site; minimum daily, 1.3 ft<sup>3</sup>/s May 24, 1939, Nov. 5, 1950, occurred prior to urban development and accompanying sewage effluent releases.

EXTREMES OUTSIDE PERIOD OF RECORD.--All flood data at site 0.8 mi downstream at present datum. Maximum gage height since at least 1835, 49.0 ft Dec. 9, 1935 (discharge, 40,000 ft<sup>3</sup>/s); furnished by engineer for Harris County. Flood of May 31, 1929, reached a gage height of 43.5 ft (discharge, 19,000 ft<sup>3</sup>/s), at bridge on Capitol Avenue, affected by bridge; furnished by city of Houston.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,840 ft<sup>3</sup>/s Apr. 5 at 1900 hours (gage height, 19.28 ft); minimum discharges not determined (affected by tides).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991  
DAILY MEAN VALUES

| DAY         | OCT   | NOV  | DEC  | JAN  | FEB  | MAR | APR  | MAY  | JUN   | JUL | AUG | SEP  |
|-------------|-------|------|------|------|------|-----|------|------|-------|-----|-----|------|
| 1           | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 2           | ---   | ---  | ---  | 1240 | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 3           | ---   | ---  | ---  | 2000 | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 4           | ---   | ---  | ---  | ---  | 2180 | --- | 939  | ---  | ---   | --- | --- | ---  |
| 5           | ---   | ---  | ---  | ---  | 1720 | --- | 2680 | ---  | ---   | --- | --- | ---  |
| 6           | ---   | ---  | ---  | ---  | ---  | --- | 2300 | ---  | ---   | --- | --- | 1710 |
| 7           | ---   | ---  | ---  | ---  | ---  | --- | ---  | 1700 | ---   | --- | --- | 1070 |
| 8           | ---   | 337  | ---  | ---  | ---  | --- | ---  | 2030 | ---   | --- | --- | ---  |
| 9           | ---   | 1190 | ---  | 1060 | ---  | --- | ---  | 1100 | ---   | --- | --- | ---  |
| 10          | ---   | ---  | ---  | 3210 | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 11          | ---   | ---  | ---  | 874  | ---  | --- | 1370 | ---  | ---   | --- | --- | ---  |
| 12          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 13          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 14          | ---   | ---  | ---  | 1090 | ---  | --- | 1780 | ---  | ---   | --- | --- | ---  |
| 15          | ---   | ---  | ---  | 3300 | ---  | --- | 2180 | ---  | 1280  | --- | --- | ---  |
| 16          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 17          | ---   | ---  | ---  | ---  | ---  | --- | 643  | ---  | 1550  | --- | --- | ---  |
| 18          | ---   | ---  | ---  | 2190 | ---  | --- | 2050 | ---  | ---   | --- | --- | ---  |
| 19          | ---   | ---  | ---  | 1320 | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 20          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | 853   | --- | --- | ---  |
| 21          | ---   | ---  | ---  | ---  | 1390 | --- | ---  | ---  | ---   | --- | --- | ---  |
| 22          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 23          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 24          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 25          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 26          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 27          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 28          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 29          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 30          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| 31          | ---   | ---  | ---  | ---  | ---  | --- | ---  | ---  | ---   | --- | --- | ---  |
| CAL YR 1990 | TOTAL | ---  | MEAN | ---  | MAX  | --- | MIN  | ---  | AC-FT | --- | --- | ---  |
| WTR YR 1991 | TOTAL | ---  | MEAN | ---  | MAX  | --- | MIN  | ---  | AC-FT | --- | --- | ---  |

**REFERENCE 22**

**U.S. Department of Commerce County and City Data Book, 1994.**



12th Edition

# County and City Data Book

# 1994

A Statistical Abstract Supplement

U.S. Department of Commerce  
Economics and Statistics Administration  
BUREAU OF THE CENSUS

Table B. Counties — Group Quarters Population and Households

| County           | Group quarters population, 1990 |                     |               | Households, 1990 |                           |                       |            |  |                   |  |         |  |                    |  |                                 |                      |  |
|------------------|---------------------------------|---------------------|---------------|------------------|---------------------------|-----------------------|------------|--|-------------------|--|---------|--|--------------------|--|---------------------------------|----------------------|--|
|                  | Total <sup>1</sup>              | College dormitories | Nursing homes | Number           | Percent change, 1980-1990 | Persons per household | Percent—   |  | By type—          |  |         |  |                    |  |                                 | Nonfamily households |  |
|                  |                                 |                     |               |                  |                           |                       | One person | With 1 or more persons 65 years and over | Family households |  |         |  | Total <sup>2</sup> | Percent with own children <sup>3</sup> | Female householder <sup>4</sup> |                      |  |
|                  |                                 |                     |               |                  |                           |                       |            |  | Total             | Percent with own children <sup>3</sup> | Total   | Percent with own children <sup>3</sup> |                    |  |                                 |                      |  |
|                  |                                 |                     |               |                  |                           |                       |            |  |                   |  |         |  |                    |  |                                 |                      |  |
| 32               | 33                              | 34                  | 35            | 36               | 37                        | 38                    | 39         | 40                                       | 41                | 42                                     | 43      | 44                                     | 45                 | 46                                     |                                 |                      |  |
| TEXAS—Con.       |                                 |                     |               |                  |                           |                       |            |  |                   |  |         |  |                    |  |                                 |                      |  |
| Falls .....      | 1 278                           | -                   | 342           | 6 492            | -6.2                      | 2.53                  | 29.3       | 38.1                                     | 4 544             | 42.9                                   | 3 444   | 41.0                                   | 919                | 49.2                                   | 1 970                           |                      |  |
| Fannin .....     | 777                             | -                   | 749           | 9 691            | 4.6                       | 2.48                  | 26.4       | 35.8                                     | 7 057             | 41.3                                   | 6 020   | 40.0                                   | 712                | 53.5                                   | 2 759                           |                      |  |
| Fayette .....    | 407                             | -                   | 354           | 8 101            | 8.2                       | 2.43                  | 28.4       | 39.4                                     | 5 736             | 42.6                                   | 4 945   | 42.5                                   | 550                | 44.9                                   | 2 385                           |                      |  |
| Fisher .....     | 69                              | -                   | 67            | 1 892            | -14.2                     | 2.52                  | 25.8       | 37.8                                     | 1 394             | 40.8                                   | 1 180   | 38.6                                   | 146                | 53.4                                   | 504                             |                      |  |
| Floyd .....      | 123                             | -                   | 93            | 2 982            | -9.8                      | 2.81                  | 22.7       | 32.5                                     | 2 339             | 47.6                                   | 2 119   | 47.2                                   | 138                | 58.0                                   | 714                             |                      |  |
| Foard .....      | 37                              | -                   | 37            | 739              | -14.1                     | 2.38                  | 31.0       | 43.2                                     | 496               | 41.1                                   | 408     | 42.9                                   | 73                 | 34.2                                   | 237                             |                      |  |
| Fort Bend .....  | 4 349                           | 26                  | 558           | 70 424           | 76.8                      | 3.14                  | 13.6       | 11.5                                     | 59 435            | 63.4                                   | 50 517  | 63.7                                   | 6 895              | 64.6                                   | 11 080                          |                      |  |
| Franklin .....   | 141                             | -                   | 133           | 3 017            | 15.3                      | 2.54                  | 23.6       | 33.4                                     | 2 307             | 41.2                                   | 2 017   | 40.3                                   | 258                | 47.7                                   | 742                             |                      |  |
| Freestone .....  | 416                             | -                   | 284           | 6 063            | 8.1                       | 2.54                  | 26.7       | 35.1                                     | 4 434             | 47.2                                   | 3 665   | 46.7                                   | 641                | 53.8                                   | 1 704                           |                      |  |
| Frio .....       | 275                             | -                   | 120           | 4 129            | 2.2                       | 3.20                  | 18.1       | 25.7                                     | 3 366             | 55.8                                   | 2 586   | 54.4                                   | 617                | 58.2                                   | 817                             |                      |  |
| Gaines .....     | 40                              | -                   | 30            | 4 502            | 7.4                       | 3.13                  | 18.4       | 21.5                                     | 3 669             | 57.5                                   | 3 195   | 58.2                                   | 305                | 56.4                                   | 878                             |                      |  |
| Galveston .....  | 2 606                           | 661                 | 890           | 81 451           | 17.6                      | 2.64                  | 24.3       | 20.8                                     | 58 334            | 50.6                                   | 45 519  | 48.6                                   | 10 043             | 60.4                                   | 23 083                          |                      |  |
| Garza .....      | 63                              | -                   | 62            | 1 822            | -1.1                      | 2.79                  | 22.4       | 31.2                                     | 1 379             | 48.9                                   | 1 230   | 47.6                                   | 120                | 64.2                                   | 427                             |                      |  |
| Gillespie .....  | 685                             | -                   | 399           | 6 711            | 28.6                      | 2.46                  | 24.2       | 40.2                                     | 5 092             | 36.9                                   | 4 684   | 35.1                                   | 322                | 58.4                                   | 1 722                           |                      |  |
| Glasscock .....  | 3                               | -                   | -             | 456              | 17.8                      | 3.17                  | 13.4       | 13.8                                     | 371               | 57.1                                   | 332     | 57.2                                   | 21                 | 66.7                                   | 79                              |                      |  |
| Goliad .....     | 69                              | -                   | 59            | 2 208            | 24.3                      | 2.68                  | 22.9       | 32.5                                     | 1 694             | 46.8                                   | 1 428   | 45.6                                   | 214                | 56.1                                   | 536                             |                      |  |
| Gonzales .....   | 316                             | -                   | 246           | 6 231            | 4.7                       | 2.71                  | 25.8       | 34.2                                     | 4 592             | 46.5                                   | 3 747   | 45.3                                   | 630                | 55.1                                   | 1 670                           |                      |  |
| Gray .....       | 256                             | -                   | 181           | 9 548            | -6.6                      | 2.48                  | 25.8       | 31.3                                     | 7 031             | 44.8                                   | 6 089   | 42.5                                   | 723                | 63.3                                   | 2 539                           |                      |  |
| Grayson .....    | 2 440                           | 864                 | 1 297         | 36 847           | 8.5                       | 2.51                  | 25.2       | 29.0                                     | 26 800            | 46.5                                   | 22 192  | 44.3                                   | 3 634              | 58.8                                   | 9 999                           |                      |  |
| Gregg .....      | 2 294                           | 852                 | 1 151         | 40 027           | 11.5                      | 2.56                  | 25.9       | 24.6                                     | 28 579            | 50.0                                   | 22 796  | 48.2                                   | 4 588              | 59.7                                   | 11 523                          |                      |  |
| Grimes .....     | 2 411                           | -                   | 127           | 6 040            | 24.4                      | 2.72                  | 23.7       | 31.4                                     | 4 437             | 48.8                                   | 3 442   | 51.9                                   | 723                | 39.7                                   | 1 575                           |                      |  |
| Guadalupe .....  | 1 324                           | 577                 | 433           | 22 663           | 44.0                      | 2.80                  | 19.2       | 23.9                                     | 18 013            | 50.2                                   | 14 896  | 48.2                                   | 2 327              | 61.9                                   | 4 889                           |                      |  |
| Hale .....       | 739                             | 321                 | 256           | 11 703           | -5.5                      | 2.90                  | 21.6       | 26.1                                     | 8 947             | 52.8                                   | 7 494   | 52.0                                   | 1 061              | 59.4                                   | 2 816                           |                      |  |
| Hall .....       | 46                              | -                   | 46            | 1 669            | -23.3                     | 2.31                  | 33.7       | 45.8                                     | 1 088             | 39.9                                   | 947     | 38.2                                   | 112                | 51.8                                   | 569                             |                      |  |
| Hamilton .....   | 276                             | -                   | 257           | 3 250            | -5.1                      | 2.29                  | 30.4       | 42.1                                     | 2 208             | 37.5                                   | 1 905   | 36.3                                   | 225                | 44.4                                   | 1 027                           |                      |  |
| Hansford .....   | 75                              | -                   | 72            | 2 112            | -6.9                      | 2.73                  | 21.9       | 24.2                                     | 1 642             | 52.7                                   | 1 467   | 52.1                                   | 117                | 72.6                                   | 481                             |                      |  |
| Hardeman .....   | 144                             | -                   | 98            | 2 101            | -15.1                     | 2.45                  | 30.3       | 40.3                                     | 1 443             | 47.7                                   | 1 189   | 46.1                                   | 178                | 50.0                                   | 666                             |                      |  |
| Hardin .....     | 297                             | -                   | 242           | 14 693           | 7.0                       | 2.79                  | 19.2       | 24.1                                     | 11 735            | 50.0                                   | 10 012  | 50.2                                   | 1 355              | 51.8                                   | 3 004                           |                      |  |
| Harris .....     | 29 144                          | 5 642               | 7 886         | 1 026 448        | 18.0                      | 2.72                  | 26.2       | 14.5                                     | 708 831           | 54.9                                   | 541 226 | 54.4                                   | 127 240            | 60.2                                   | 318 987                         |                      |  |
| Harrison .....   | 1 434                           | 718                 | 518           | 20 705           | 14.7                      | 2.71                  | 23.0       | 27.4                                     | 15 729            | 49.7                                   | 12 582  | 48.8                                   | 2 659              | 53.1                                   | 5 085                           |                      |  |
| Hartley .....    | 90                              | -                   | 84            | 1 332            | -2.1                      | 2.66                  | 20.4       | 26.4                                     | 1 041             | 46.1                                   | 990     | 45.6                                   | 32                 | 56.3                                   | 293                             |                      |  |
| Haskell .....    | 133                             | -                   | 122           | 2 753            | -7.6                      | 2.43                  | 27.7       | 41.5                                     | 1 957             | 42.7                                   | 1 754   | 41.1                                   | 153                | 58.2                                   | 786                             |                      |  |
| Hays .....       | 6 152                           | 4 621               | 373           | 22 218           | 76.6                      | 2.68                  | 22.3       | 16.0                                     | 14 443            | 51.7                                   | 12 331  | 51.8                                   | 1 493              | 55.9                                   | 7 722                           |                      |  |
| Hemphill .....   | 52                              | -                   | 47            | 1 348            | -26.6                     | 2.72                  | 22.0       | 24.6                                     | 1 011             | 53.6                                   | 912     | 52.9                                   | 64                 | 76.6                                   | 312                             |                      |  |
| Henderson .....  | 983                             | 245                 | 556           | 22 947           | 42.6                      | 2.51                  | 22.6       | 34.0                                     | 17 379            | 39.7                                   | 14 872  | 37.2                                   | 1 972              | 56.5                                   | 5 582                           |                      |  |
| Hidalgo .....    | 3 808                           | 335                 | 1 136         | 103 479          | 36.5                      | 3.67                  | 13.4       | 25.8                                     | 88 615            | 61.1                                   | 69 966  | 61.7                                   | 15 217             | 60.8                                   | 14 899                          |                      |  |
| Hill .....       | 960                             | 125                 | 491           | 10 288           | 6.0                       | 2.55                  | 25.7       | 37.1                                     | 7 502             | 42.5                                   | 6 320   | 41.6                                   | 910                | 48.0                                   | 2 855                           |                      |  |
| Hockley .....    | 553                             | 409                 | 77            | 7 988            | 6.2                       | 2.96                  | 18.9       | 23.3                                     | 6 446             | 55.0                                   | 5 594   | 53.8                                   | 652                | 68.9                                   | 1 588                           |                      |  |
| Hood .....       | 338                             | -                   | 254           | 11 137           | 64.8                      | 2.57                  | 19.2       | 27.8                                     | 8 778             | 43.3                                   | 7 796   | 42.1                                   | 695                | 55.3                                   | 2 390                           |                      |  |
| Hopkins .....    | 427                             | -                   | 377           | 10 965           | 15.1                      | 2.59                  | 24.2       | 29.6                                     | 8 033             | 47.9                                   | 6 899   | 46.7                                   | 858                | 57.1                                   | 2 862                           |                      |  |
| Houston .....    | 1 837                           | -                   | 293           | 7 792            | 8.2                       | 2.51                  | 26.4       | 37.0                                     | 5 646             | 44.3                                   | 4 372   | 42.0                                   | 1 047              | 55.9                                   | 2 127                           |                      |  |
| Howard .....     | 2 195                           | 195                 | 457           | 11 477           | -4.1                      | 2.63                  | 23.7       | 27.8                                     | 8 463             | 47.7                                   | 6 817   | 45.1                                   | 1 298              | 60.6                                   | 2 911                           |                      |  |
| Hudspeth .....   | 107                             | -                   | -             | 946              | 15.1                      | 2.97                  | 22.1       | 23.8                                     | 748               | 56.1                                   | 641     | 54.4                                   | 85                 | 76.5                                   | 221                             |                      |  |
| Hunt .....       | 1 579                           | 790                 | 530           | 24 075           | 18.4                      | 2.61                  | 23.9       | 26.4                                     | 17 673            | 47.2                                   | 14 729  | 45.4                                   | 2 223              | 59.5                                   | 6 325                           |                      |  |
| Hutchinson ..... | 305                             | 120                 | 108           | 9 642            | -2.0                      | 2.63                  | 22.5       | 28.7                                     | 7 343             | 48.7                                   | 6 420   | 47.5                                   | 623                | 58.6                                   | 2 362                           |                      |  |
| Irion .....      | -                               | -                   | -             | 601              | 18.5                      | 2.71                  | 19.1       | 26.5                                     | 485               | 50.1                                   | 433     | 49.9                                   | 38                 | 55.3                                   | 116                             |                      |  |
| Jack .....       | 116                             | -                   | 77            | 2 725            | -5.8                      | 2.52                  | 26.1       | 33.8                                     | 1 927             | 48.3                                   | 1 750   | 46.5                                   | 135                | 70.4                                   | 773                             |                      |  |
| Jackson .....    | 141                             | -                   | 111           | 4 833            | 3.2                       | 2.67                  | 23.7       | 33.3                                     | 3 680             | 44.6                                   | 3 011   | 44.7                                   | 491                | 48.5                                   | 1 305                           |                      |  |
| Jasper .....     | 366                             | -                   | 337           | 11 427           | 6.7                       | 2.69                  | 21.9       | 31.0                                     | 8 827             | 45.8                                   | 7 457   | 43.9                                   | 1 183              | 58.9                                   | 2 588                           |                      |  |
| Jeff Davis ..... | 54                              | -                   | -             | 779              | 31.6                      | 2.43                  | 28.6       | 34.0                                     | 533               | 42.4                                   | 469     | 39.7                                   | 44                 | 70.5                                   | 246                             |                      |  |
| Jefferson .....  | 4 443                           | 746                 | 1 819         | 90 520           | 3                         | 2.60                  | 26.1       | 26.9                                     | 64 768            | 47.9                                   | 49 880  | 46.0                                   | 12 111             | 57.5                                   | 25 635                          |                      |  |
| Jim Hogg .....   | 5                               | -                   | -             | 1 675            | 7.1                       | 3.05                  | 20.4       | 31.7                                     | 1 326             | 56.0                                   | 1 040   | 57.2                                   | 230                | 47.8                                   | 340                             |                      |  |
| Jim Wells .....  | 476                             | -                   | 393           | 11 979           | 7.3                       | 3.11                  | 18.2       | 25.8                                     | 9 647             | 53.9                                   | 7 809   | 55.3                                   | 1 479              | 54.6                                   | 2 317                           |                      |  |
| Johnson .....    | 1 879                           | 288                 | 893           | 33 462           | 44.7                      | 2.85                  | 17.1       | 20.7                                     | 26 782            | 51.8                                   | 23 035  | 51.0                                   | 2 768              | 56.5                                   | 6 486                           |                      |  |
| Jones .....      | 394                             | -                   | 361           | 6 180            | -2.9                      | 2.60                  | 24.4       | 34.2                                     | 4 574             | 46.4                                   | 3 944   | 46.6                                   | 453                | 37.7                                   | 1 571                           |                      |  |
| Karnes .....     | 237                             | -                   | 230           | 4 337            | -4.1                      | 2.82                  | 23.7       | 35.3                                     | 3 284             | 49.0                                   | 2 548   | 48.2                                   | 513                | 54.8                                   | 1 047                           |                      |  |
| Kaufman .....    | 1 273                           | 118                 | 572           | 17 827           | 35.5                      | 2.86                  | 19.0       | 24.2                                     | 14 179            | 51.4                                   | 11 669  | 50.6                                   | 1 975              | 58.0                                   | 3 656                           |                      |  |
| Kendall .....    | 384                             | -                   | 253           | 5 342            | 40.5                      | 2.66                  | 19.7       | 28.2                                     | 4 216             | 46.9                                   | 3 691   | 46.0                                   | 443                | 58.5                                   | 1 149                           |                      |  |
| Kenedy .....     | 11                              | -                   | -             | 145              | -14.2                     | 3.10                  | 16.6       | 22.1                                     | 112               | 43.8                                   | 105     | 44.8                                   | 3                  | -                                      | 22                              |                      |  |
| Kent .....       | 25                              | -                   | 25            | 399              | -7.4                      | 2.47                  | 26.6       | 35.3                                     | 283               | 41.3                                   | 260     | 41.5                                   | 17                 | 41.2                                   | 116                             |                      |  |
| Kerr .....       | 2 035                           | 343                 | 499           | 14 384           | 28.8                      | 2.38                  | 27.4       | 40.1                                     | 10 183            | 39.5                                   | 8 567   | 35.5                                   | 1 358              | 61.6                                   | 4 196                           |                      |  |
| Kimble .....     | 69                              | -                   | 55            | 1 624            | 3.8                       | 2.50                  | 24.4       | 37.5                                     | 1 214             | 41.2                                   | 1 067   | 36.8                                   | 112                | 78.6                                   | 421                             |                      |  |
| King .....       | -                               | -                   | -             | 124              | -19.5                     | 2.85                  | 14.5       | 13.7                                     | 108               | 55.6                                   | 104     | 56.7                                   | 1                  | 100.0                                  | 19                              |                      |  |
| Kinney .....     | 41                              | -                   | -             | 1 187            | 54.0                      | 2.59                  | 26.7       | 40.2                                     | 877               | 38.5                                   | 775     | 36.1                                   | 66                 | 62.1                                   | 334                             |                      |  |
| Kleberg .....    | 1 227                           | 840                 | 103           | 10 058           | -2.2                      | 2.89                  | 21.8       | 21.9                                     | 7 268             | 53.2                                   | 5 819   | 52.6                                   | 1 228              | 60.3                                   | 2 631                           |                      |  |
| Knox .....       | 106                             | -                   | 101           | 1 887            | -7.6                      | 2.51                  | 28.8       | 38.8                                     | 1 338             | 45.4                                   | 1 152   | 44.0                                   | 140                | 55.7                                   | 563                             |                      |  |
| Lamar .....      | 971                             | 195                 | 695           | 16 798           | 6.9                       | 2.56                  | 25.0       | 31.5                                     | 12 448            | 46.2                                   | 10 203  | 45.2                                   | 1 842              | 52.6                                   | 4 359                           |                      |  |
| Lamb .....       | 142                             | -                   | 121           | 5 488            | -14.4                     | 2.72                  | 24.1       | 34.7                                     | 4 129             | 46.9                                   | 3 543   | 45.8                                   | 444                | 56.1                                   | 1 345                           |                      |  |
| Lampasas .....   | 168                             | -                   | 145           | 5 058            | 14.6                      | 2.64                  | 23.2       | 29.5                                     | 3 751             | 49.8                                   | 3 198   | 48.5                                   | 451                | 58.8                                   | 1 268                           |                      |  |
| La Salle .....   | 62                              | -                   | -             | 1 701            | -1.4                      | 3.05                  | 21.6       | 31.8                                     | 1 354             | 47.6                                   | 1 046   | 51.7                                   | 272                | 35.3                                   | 418                             |                      |  |
| Lavaca .....     | 360                             | -                   | 320           | 7 349            | 2.8                       | 2.49                  | 27.5       | 40.7                                     | 5 212             | 42.7                                   | 4 480   | 41.2                                   | 597                | 56.6                                   | 2 077                           |                      |  |
| Lee .....        | 520                             | -                   | 136           | 4 706            | 22.0                      | 2.62                  | 24.5       | 30.2                                     | 3 447             | 49.5                                   | 2 900   | 48.3                                   | 363                | 58.4                                   | 1 206                           |                      |  |

<sup>1</sup>Includes persons in other institutional and noninstitutional group quarters, not shown separately.  
<sup>2</sup>Under 18 years. <sup>3</sup>No husband present.

<sup>4</sup>Includes male householder families with no wife present, not shown separately.

**REFERENCE 23**

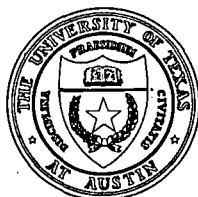
**Land Resources Laboratory Map Series: Land and Water Resources - Houston-Galveston Area  
Council. Bureau of Economic Geology, 1975.**

# LAND RESOURCES LABORATORY MAP SERIES

## Land and Water Resources – Houston-Galveston Area Council

by

A. E. St.Clair, C. V. Proctor, Jr., W. L. Fisher,  
C. W. Kreidler, and J. H. McGowen



BUREAU OF ECONOMIC GEOLOGY  
THE UNIVERSITY OF TEXAS AT AUSTIN  
AUSTIN, TEXAS 78712  
C. G. GROAT, ACTING DIRECTOR  
1975

Table 2. Ages and stratigraphic names of natural depositional systems, HGAC.

| GEOLOGIC AGE |                   |             | AGE<br>(MILLION<br>OF<br>YEARS) | STRATIGRAPHIC NAME                               | DEPOSITIONAL SYSTEMS,<br>HGAC                                     | LAND AND WATER<br>RESOURCE UNITS,<br>HGAC  |
|--------------|-------------------|-------------|---------------------------------|--|---|--|
| CENOZOIC ERA | QUATERNARY PERIOD | Holocene    | .2                              | Alluvium   | Fluvial; Deltaic; Marsh-Swamp;<br>Bay-Lagoon; Barrier-Strandplain | B1, B2, B3, B4, B5, B6;<br>B7, F8; D1, D2, D3, D4;<br>F1, F2, F3, F4, F5, F6,<br>F7, F11, F12; C1, C2,<br>C3, C4 |
|              |                   | Pleistocene |                                 | Beaumont Formation<br>(including Ingleside sand) | Fluvial-Deltaic; Barrier-Strandplain                              | A2, A4; A1   |
|              |                   |             |                                 | Lissie Formation                                 | Fluvial (meanderbelt)   | A2, A3, A9   |
|              |                   |             |                                 | Willis Formation                                 | Alluvial Fan, Braided Streams                                     | A1, A8, A3, A6   |
|              | TERTIARY PERIOD   | ?           | 3                               | Goliad Formation<br>(does not occur in HGAC)     | -----   | -----  |
|              |                   | Pliocene    |                                 |  |   |  |
|              |                   | Miocene     | 11                              | Fleming Formation                                | Fluvial   | A4, A5   |
|              |                   | ?           | 25                              | Catahoula Formation                              | Fluvial-Deltaic   | A7, A2   |
|              |                   | Oligocene   |                                 | Vicksburg Formation<br>(subsurface only)         | -----   | -----  |
|              |                   | ?           | 40                              | Jackson Group                                    | Fluvial-Deltaic   | A2, A7   |

across northern Walker County. Younger fluvial deposits (Fleming and Willis Formations) in north-western and northeastern HGAC were deposited in the channels and on the floodplains of Tertiary rivers.

*Pleistocene systems.*—Coastward of the outcrop belt of Tertiary fluvial deposits is a large area underlain by Pleistocene alluvial fan deposits composed of sand and gravel (Willis Formation). These were formed by high-gradient braided streams that flowed coastward from the Tertiary uplands to deposit coalescing alluvial fans.

Coastward of the alluvial fans, younger Pleistocene meanderbelt fluvial sands and muds (Lissie Formation) grade into fluvial-deltaic deposits (Beaumont Formation) which extend almost to the present coastline. This fluvial-deltaic

system, which is characterized by elongate distributary channel sands and interdistributary muds, extends across the central and southern HGAC. Near the present coastline, Pleistocene marine-deltaic sands mark the terminus of the relict delta system. Pleistocene barrier-strandplain sands (Ingleside sands) occur in a discontinuous belt in the southeastern part of HGAC.

*Holocene-Modern systems.*—Holocene-Modern fluvial systems extend across the outcrop of relict Tertiary and Pleistocene deposits. These fluvial systems are composed of sediments deposited by the Colorado, Brazos, San Jacinto, and Trinity Rivers during the past 20,000 years. Fluvial processes are still active in these systems, and fluvial sand and mud are presently being deposited. In the lower reaches of these fluvial systems, deltaic deposition is occurring along natural levees,

**REFERENCE 24**

**U.S. Geological Survey, Water Resources Investigations Report 87-4153. Ground-Water Withdrawals and Changes in Ground-Water Levels, Ground-Water Quality, Etc. in the Houston District, Texas, 1980-84.**

**GROUND-WATER WITHDRAWALS AND CHANGES IN  
GROUND-WATER LEVELS, GROUND-WATER QUALITY, AND  
LAND-SURFACE SUBSIDENCE IN THE HOUSTON DISTRICT,  
TEXAS, 1980-84**

---

**U.S. GEOLOGICAL SURVEY**

**Water-Resources Investigations Report 87-4153**



Prepared in cooperation with the  
**CITY OF HOUSTON** and the  
**HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT**

## INTRODUCTION

The purpose of this report is to provide information about ground-water withdrawals, changes in ground-water levels, ground-water quality, and trends in land-surface subsidence in the Houston district during 1980-84. Some data collected prior to 1980 and during the early spring of 1985 are presented to establish long-term trends and relations.

The Houston district, as described in this report, includes all of Galveston County and parts of Brazoria, Chambers, Fort Bend, Harris, Liberty, and Waller Counties (fig. 1). Many homeowners, well drillers, industrial-plant managers, and State and municipal officials provided information for this report. Financial support was provided by the city of Houston and the Harris-Galveston Coastal Subsidence District in a cooperative agreement with the U.S. Geological Survey.

## GEOHYDROLOGY OF THE STUDY AREA

The geohydrologic units discussed in this report primarily are the Chicot and Evangeline aquifers. The Jasper aquifer also underlies the Houston district, but contains water of poor quality except in the northern part of the district. Only two wells presently are known to yield water from the Jasper aquifer in Harris County. These aquifers are composed of sedimentary deposits in the Coastal Plain physiographic province. The province is a broad plain underlain by a southeasterly thickening wedge of layered beds of clay, silt, sand, and gravel. The geologic formations in the study area are, from oldest to youngest: The Oakville Sandstone and Fleming Formation of Miocene age; the Goliad Sand of Pliocene age; the Willis Sand, Bentley Formation, Montgomery Formation, and Beaumont Formation of Pleistocene age; and alluvium of Quaternary age. The relation among the geohydrologic units and the geologic formations is given in table 1. A generalized geohydrologic section of the Chicot, Evangeline, and Jasper aquifers through Montgomery, Harris, Brazoria, and Galveston Counties is shown in figure 2.

### Chicot Aquifer

The Chicot aquifer includes all deposits from the land surface to the top of the Evangeline aquifer. The Chicot aquifer is composed of the Willis Sand, Bentley Formation, Montgomery Formation, Beaumont Formation, and Quaternary alluvium. The altitude of the base of the Chicot aquifer is shown in figure 3. The discontinuous sand and clay layers of the Chicot aquifer in some parts of the study area are separated into an upper and lower unit (Jorgensen, 1975, p. 10). When the upper unit of the Chicot aquifer cannot be defined, the aquifer is undifferentiated. The Chicot aquifer is under confined conditions except in the northern part of the district. Generally, in southeastern Harris County and most of Galveston County, the Chicot aquifer contains a thick sand section that has a relatively large (as much as 75 ft/d) hydraulic conductivity (Jorgensen, 1975, p. 15). This sand unit has been intensely pumped and is known locally as the Alta Loma Sand (Alta Loma Sand of Rose, 1943). In this area, there also is another sand unit within the Chicot aquifer referred to as the middle Chicot aquifer. The Chicot aquifer is the main source of ground water in Galveston and southern Harris Counties.



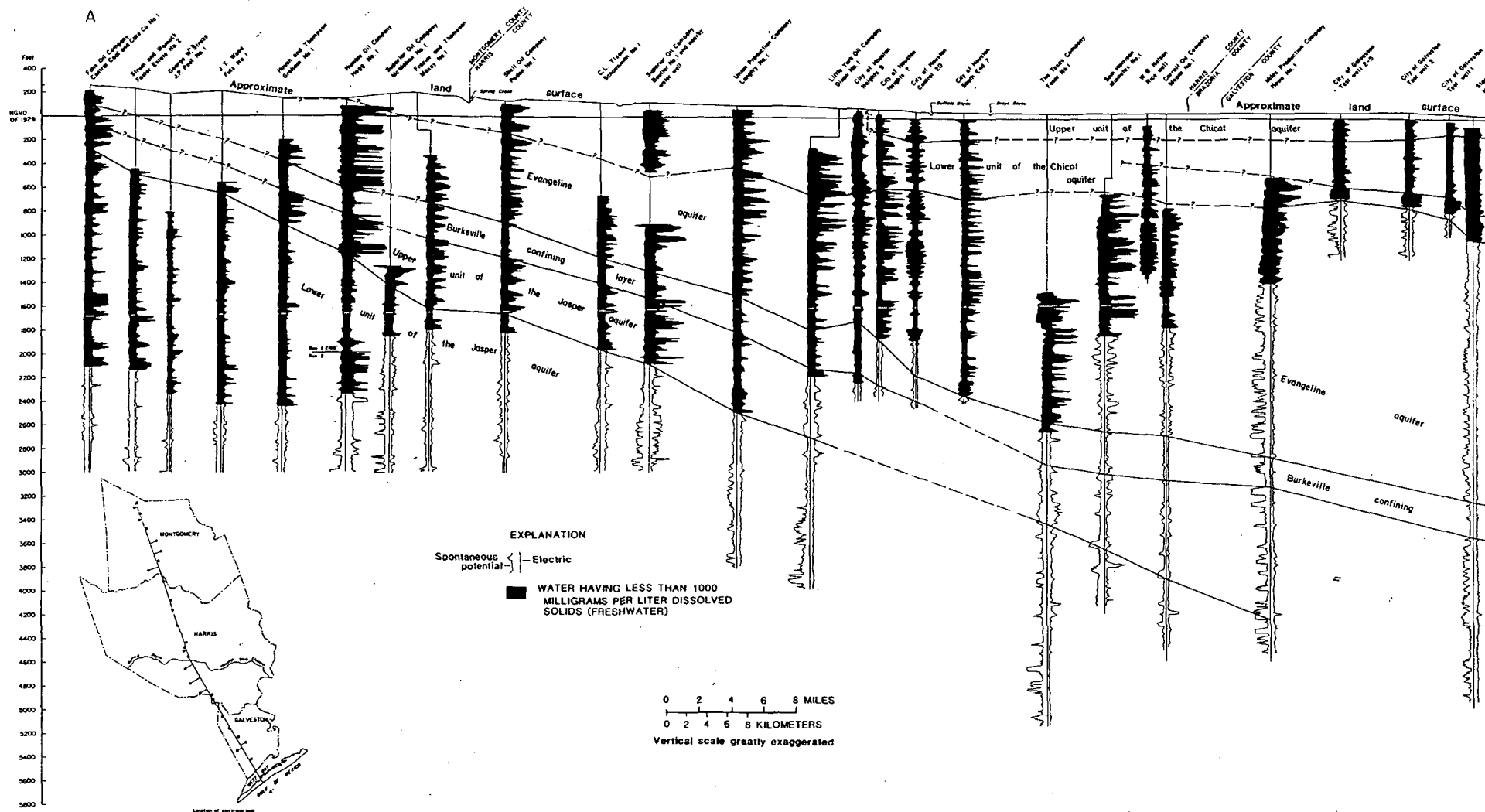


Figure 2.—Correlation of hydrologic units from northern Montgomery County to the Gulf of Mexico.

### Evangeline Aquifer

The Evangeline aquifer, composed of the Goliad Sand and the upper part of the Fleming Formation, is similar in lithology to the Chicot aquifer. One difference between the two aquifers is that the Evangeline aquifer generally has a smaller hydraulic conductivity than does the Chicot aquifer. The contrast in hydraulic conductivity and a difference in water levels are the bases for separating the Evangeline aquifer from the Chicot aquifer. The altitude of the base of the Evangeline aquifer is shown in figure 4. The Evangeline aquifer is the major source of ground water in the Houston district. In Galveston and southern Harris Counties, water in the Evangeline aquifer is saline and is not used.

### Jasper Aquifer

The Jasper aquifer is composed of interbedded sand and clay layers consisting almost entirely of terrigenous clastic sediments. The approximate altitude of the top of the Jasper aquifer is shown in figure 5. Because the Jasper aquifer underlies shallower aquifers, withdrawals from the Jasper aquifer in terms of total withdrawals in Harris County are not significant. However, hydraulically it is capable of yields of as much as 3,000 gal/min to wells in adjacent Montgomery County (Baker, 1983). Only the upper part of the Jasper aquifer is utilized in Harris County.

## DEVELOPMENT OF GROUND WATER

Several publications document the historical development of ground-water withdrawals in the Houston district (Wood and Gabrysch, 1965; Gabrysch, 1972, 1980, 1982; Jorgensen, 1975; Carr and others, 1985). The areas discussed in this report are Houston, Katy, Pasadena, Baytown-LaPorte, Johnson Space Center, Texas City, and Alta Loma (fig. 6).

Prior to 1977, ground water was the major source of freshwater available in the Houston district. Small quantities of surface water obtained from Lake Houston on the San Jacinto River had been available in parts of the Houston district since 1954. The city of Galveston began using surface water from Lake Houston in 1973. In late 1976, surface water from Lake Livingston on the Trinity River became available. The availability of the increased surface water caused ground-water production to decrease substantially in all areas of the Houston district except the Katy area.

In areas to the north, west, and southwest of the Houston area (fig. 6), ground-water withdrawals for public supply have steadily increased due to urban expansion and the lack of surface water. The average daily ground-water withdrawals for public supply, industrial use, and irrigation in the Houston district during 1975-84 are listed in tables 2-4.

In general, until 1977, water levels in wells in the Houston district were declining. However, during the last several years, Houston and several adjacent areas have been converting from ground water to surface water as the main water supply. With the increasing conversion from ground-water use to surface-water use, water levels in wells in the Chicot and Evangeline aquifers began to rise

**REFERENCE 25**

**Geologic Atlas of Texas, Houston Sheet, 1:250,000. Bureau of Economic Geology, Austin, Texas, 1982.**



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THE UNIVERSITY OF TEXAS AT AUSTIN  
AUSTIN, TEXAS 78712

W. L. GIBBS, Director

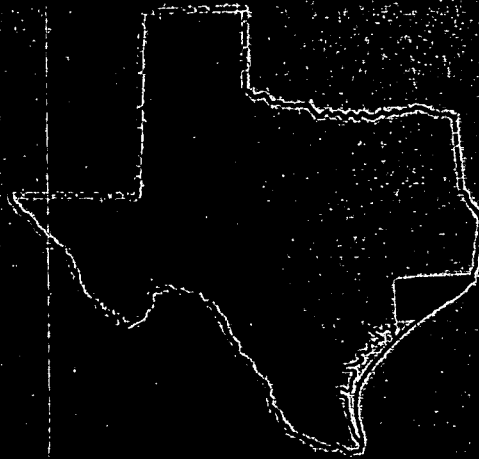
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GEOLOGIC ATLAS OF TEXAS

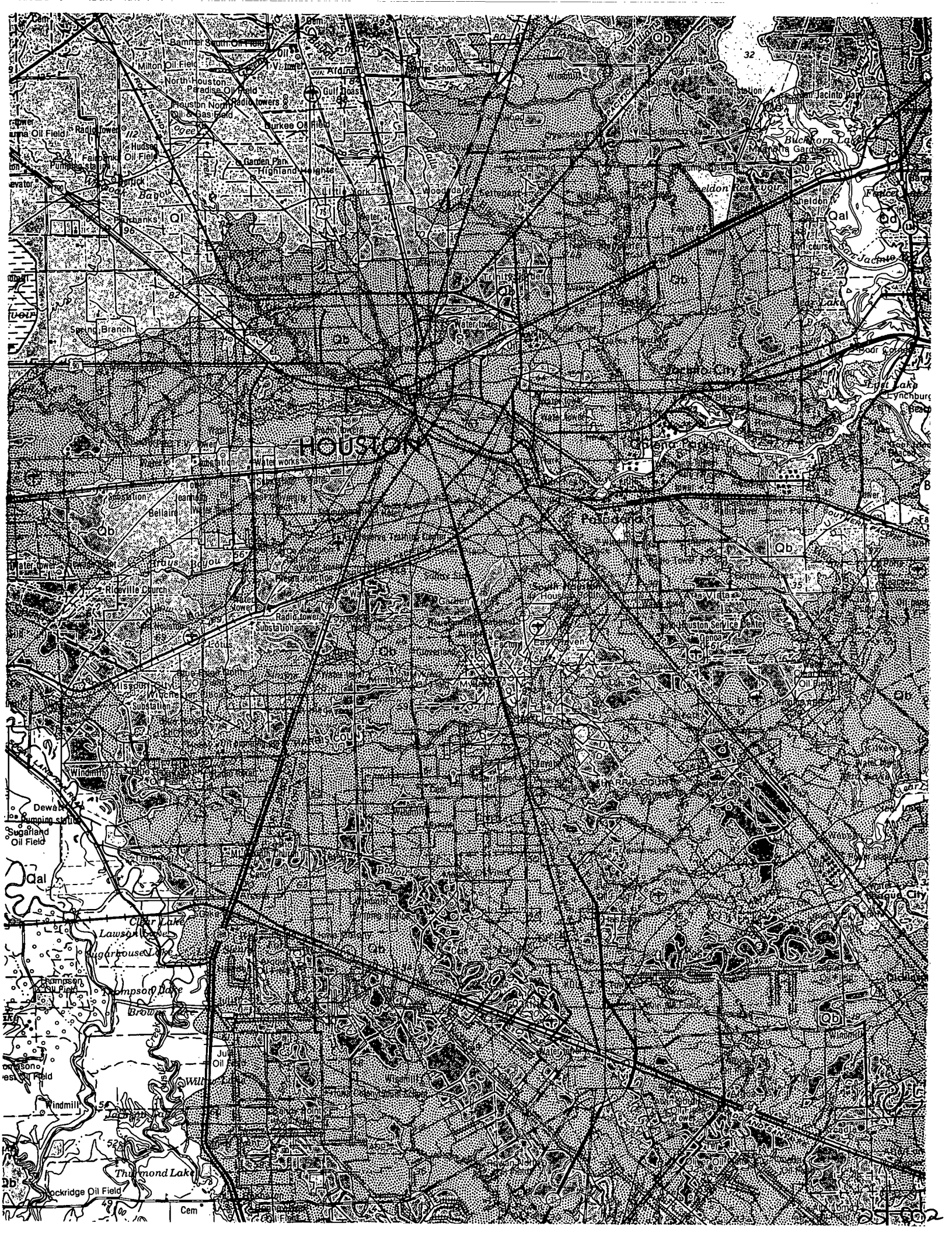
Houston Sheet

Scale: 1:250,000

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1982



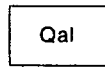
# MEXICO

## EXPLANATION



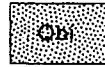
### Fill and spoil

Fill, F, material dredged for raising land surface above alluvium and barrier-island deposits and for creating land. Spoil, S, dredged material along waterways



### Alluvium

Clay, silt, and sand, organic matter abundant locally; includes point-bar, natural levee, stream channel, backswamp, coastal marsh, mud-flat, and narrow beach deposits that are shown by line symbol



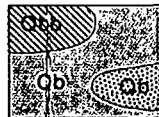
### Barrier-island deposits

Sand, silt, and clay; mostly sand, well-sorted, fine-grained, abundant shells and shell fragments; inter-fingers with clay and silt in landward direction; includes beach ridge, spit, tidal channel, tidal-delta, and sand dune deposits



### Deweyville Formation

Sand, silt, and clay, some gravel; includes point-bar, natural levee, stream channel, and backswamp deposits at a level only slightly above that of the present floodplain; sand coarser than that in alluvium; surface characterized by relict meanders of much larger radius of curvature than those of present streams, some scattered pimple mounds; thickness locally more than 50 feet. High-level Deweyville, Qd?, surfaces cut into the Beaumont Formation, and high-level Deweyville deposits along Trinity River are intermediate in position between the surface of the Beaumont and the level of most Deweyville deposits



### Beaumont Formation

Beaumont Formation, Qb, with barrier-island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, and sand; includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits; concretions of calcium carbonate, iron oxide, and iron-manganese oxides in zone of weathering; surface almost featureless, characterized by relict river channels shown by meander patterns and pimple mounds on meanderbelt ridges, separated by areas of low, relatively smooth, featureless backswamp deposits without pimple mounds; thickness  $\pm 100$  feet. The stippled overprint (source shown in Index to Geologic Mapping) shows areas that are "Dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity; geologic units include interdistributary muds, abandoned channel-fill muds, and overbank fluvial muds." The nonstippled areas are "Dominantly clayey sand and silt of moderate permeability and drainage, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands"



### Lissie Formation

Upper part, clay, silt, sand, and very minor siliceous gravel; abundant northwestward, locally calcareous, concretions; manganese oxides common in zone of weathering; fluvialite, numerous rounded shallow depressions and pimple mound amount of gravel; gravel slightly coarser than in upper part, abundant than in upper part; fluvialite; very gently rolling



### Willis Formation

Clay, silt, sand, and minor siliceous gravel of granule to peb coarser than in younger units. Deeply weathered and later oxide locally, concretions of iron oxide numerous, noncalca



### Tertiary rocks on Hockley

Sandstone, very fine grained, hard, abundant porcelaneous grayish white; possibly Catahoula Formation (Stenzel, reference.)

CR

Outcrop of caprock reported on  
Not found. Reportedly used for building

U

D

Fault

U, upthrown; D, downth.

10,000-meter Universal Transverse Mercator

Partially funded by Texas Department of Transportation

15'

400000m E

94°00'

25-003

INDEX OF GEOLOGIC

**REFERENCE 26**

**U.S. Environmental Protection Agency Hazard Ranking System Guidance Manual. EPA540-R-92-026. November 1992.**

United States  
Environmental Protection  
Agency

Office of Solid Waste  
and Emergency  
Response

Publication 9345.1-07  
PB92-963377  
EPA 540-R-92-026  
November 1992

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Superfund

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# Hazard Ranking System Guidance Manual



**REFERENCE 27**

**Record of Communication To: John Cooper, Jacinto City Water Department  
From: Ken Jensen, Fluor Daniel, Inc., Regarding Jacinto City Water Supply, 5/22/95.**

**Date:** 22 May 95  
**Time:** 2:20 pm PST  
**Call From:** Ken Jensen  
**Entity/Position:** Fluor Daniel  
**Phone #:** (714) 975-2106  
  
**To:** John Cooper  
**Entity/Position:** Jacinto City Water Dept  
**Phone #:** (713) 674-8424

**Relevant Information:**

John called to provide information on the supply wells run by Jacinto City. These wells are slightly over 3 miles from the Wallisville Road site (East/Southeast).

Since 1992, Jacinto City has been required by regional ordinance (by the prompting of the Subsidence District people) to obtain 80% of its drinking water from surface water sources. The only surface water in the area is provided by the City of Houston, from its intakes on Lake Houston and the Trinity River.

Jacinto City supplies about 10,000 people with water; 20% of this water is derived from its groundwater wells located within 4 miles of the Wallisville Road site. Therefore, it is estimated that these wells supply water to approximately 2,000 people.

Record Information

1. Site Name: Olin, Wallsiville Road  
(as entered in CERCLIS)
2. Site CERCLIS Number: TXD000607028
3. Site Reviewer: Ken Jensen, Fluor Daniel, Inc.
4. Date: June 8, 1995
5. Site Location: Houston/Harris County, Texas  
(City/County,State)
6. Congressional District: 2
7. Site Coordinates: Single  
Latitude: 29°47'20. " Longitude: 95°17'20.

Site Description

1. Setting: Urban
2. Current Owner: Private - Industrial
3. Current Site Status: Inactive
4. Years of Operation: Inactive Site, from and to dates: 1950 to 1972
5. How Initially Identified: State/Local Program
6. Entity Responsible for Waste Generation:
  - Other - Pesticide Formulation
7. Site Activities/Waste Deposition:
  - Other - Pesticide Formulation

Waste Description

8. Wastes Deposited or Detected Onsite:

- Pesticides/Herbicides

Response Actions

9. Response/Removal Actions:

- Emergency Waste Removal Has Occurred
- Site Access Has Been Restricted
- Other Removal Action Has Occurred

RCRA Information

10. For All Active Facilities, RCRA Site Status:

- Not Applicable

Demographic Information

11. Workers Present Onsite: Yes

12. Distance to Nearest Non-Worker Individual: > 10 Feet - 1/4 Mile

13. Residential Population Within 1 Mile: 7762.0

14. Residential Population Within 4 Miles: 156465.0

Water Use Information

15. Local Drinking Water Supply Source:

- Ground Water (within 4 mile distance limit)

16. Total Population Served by Local Drinking Water Supply Source: 20706.0

17. Drinking Water Supply System Type for Local Drinking  
Water Supply Sources:

- Municipal (Services over 25 People)
- Private

18. Surface Water Adjacent to/Draining Site:

PREscore 3.0 - PRESCORE.TCL File 07/25/94  
HRS DOCUMENTATION RECORD  
Olin, Wallsiville Road - 07/24/95

PAGE: 1

1. Site Name: Olin, Wallsiville Road  
(as entered in CERCLIS)
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(City/County,State)
6. Congressional District: 2
7. Site Coordinates: Single

Latitude: 29°47'20. "

Longitude: 95°17'20.

|   | Score |
|---|-------|
| Ground Water Migration Pathway Score (Sgw)  | 0.38  |
| Surface Water Migration Pathway Score (Ssw) | 0.00  |
| Soil Exposure Pathway Score (Ss)            | 16.48 |
| Air Migration Pathway Score (Sa)            | 1.44  |

|            |      |
|------------|------|
| Site Score | 8.28 |
|------------|------|

NOTE

EPA uses the terms "facility," "site," and "release" interchangeably. The term "facility" is broadly defined in CERCLA to include any area where hazardous substances have "come to be located" (CERCLA Section 109(9)), and the listing process is not intended to define or reflect boundaries of such facilities or releases. Site names, and references to specific parcels or properties, are provided for general identification purposes only. Knowledge regarding the extent of sites will be refined as more information is developed during the RI/FS and even during implementation of the remedy.

## WASTE QUANTITY

Olin, Wallsiville Road - 07/24/95

## 1. WASTESTREAM QUANTITY SUMMARY TABLE, SOURCE: Soils on site

|  |          |
|--|----------|
| a. Wastestream ID                            |          |
| b. Hazardous Constituent Quantity (C) (lbs.) | 0.00     |
| c. Data Complete?                            | NO       |
| d. Hazardous Wastestream Quantity (W) (lbs.) | 0.00     |
| e. Data Complete?                            | NO       |
| f. Wastestream Quantity Value (W/5,000)      | 0.00E+00 |

## WASTE QUANTITY

Olin, Wallsiville Road - 07/24/95

## 2. SOURCE HAZARDOUS WASTE QUANTITY FACTOR TABLE

|  |                   |                   |           |
|--|-------------------|-------------------|-----------|
| a. Source ID   |                   | Soils on site     |           |
| b. Source Type   |                   | Contaminated Soil |           |
| c. Secondary Source Type   |                   | N.A.              |           |
| d. Source Vol. (yd3/gal)   | Source Area (ft2) | 0.00              | 784080.00 |
| e. Source Volume/Area Value                                      |                   | 2.31E+01          |           |
| f. Source Hazardous Constituent Quantity (HCQ) Value (sum of 1b) |                   | 0.00E+00          |           |
| g. Data Complete?  |                   | NO                |           |
| h. Source Hazardous Wastestream Quantity (WSQ) Value (sum of 1f) |                   | 0.00E+00          |           |
| i. Data Complete?  |                   | NO                |           |
| k. Source Hazardous Waste Quantity (HWQ) Value (2e, 2f, or 2h)   |                   | 2.31E+01          |           |

| Source<br>Hazardous Substances | Depth<br>(feet) | Liquid | Concent. | Units |
|--------------------------------|-----------------|--------|----------|-------|
| DDD                            | < 2             | NO     | 1.0E+02  | ppm   |
| DDE                            | < 2             | NO     | 1.0E+02  | ppm   |
| DDT                            | < 2             | NO     | 1.0E+02  | ppm   |
| Lindane                        | < 2             | NO     | 1.0E+02  | ppm   |
| Pentachloronitrobenzene        | < 2             | NO     | 1.0E+02  | ppm   |
| Toxaphene                      | < 2             | NO     | 1.0E+03  | ppm   |

## Documentation for Source Type:

Main constituent of concern on site is contaminated soils (Ref 03, p. 6).

Reference: 3

## WASTE QUANTITY

Olin, Wallsiville Road - 07/24/95

## Documentation for Source Hazardous Substances:

Based on conversations with TNRCC field sampling personnel, there are 6 major contaminants on site: lindane, pentachloronitrobenzene, 4,4'-DDT; 4,4'-DDD; 4,4'-DDE, and toxaphene (Ref 12, 001). This is echoed by the EPA Potential Hazardous Waste Site inspection Report (Ref 03, p. 3)

Reference: 3, 12

## Documentation for Source Area:

The entire 18 acre site was considered as contaminated for scoring purposes. Square footage was calculated by multiplying the 18 acres by 43,560 square feet per acre (Ref 03, 003).

Reference: 3



## WASTE QUANTITY

Olin, Wallsiville Road - 07/24/95

## 3. SITE HAZARDOUS WASTE QUANTITY SUMMARY

| No. Source ID   | Migration Pathways | Vol. or Area Value (2e) | Constituent or Wastestream Value (2f,2h) | Hazardous Waste Qty. Value (2k) |
|-----------------|--------------------|-------------------------|--|---------------------------------|
| 1 Soils on site | GW-SE-A            | 2.31E+01                | 0.00E+00                                 | 2.31E+01                        |

## WASTE QUANTITY

Olin, Wallsiville Road - 07/24/95

## 4. PATHWAY HAZARDOUS WASTE QUANTITY AND WASTE CHARACTERISTICS SUMMARY TABLE

| Migration Pathway       | Contaminant Values             | HWQVs* | WCVs** |
|-------------------------|--------------------------------|--------|--------|
| Ground Water            | Toxicity/Mobility 2.00E-01     | 10     | 1      |
| SW: Overland Flow, DW   | Tox./Persistence 0.00E+00      | 0      | 0      |
| SW: Overland Flow, HFC  | Tox./Persis./Bioacc. 0.00E+00  | 0      | 0      |
| SW: Overland Flow, Env  | Etox./Persis./Bioacc. 0.00E+00 | 0      | 0      |
| SW: GW to SW, DW        | Tox./Persistence 2.00E-01      | 10     | 1      |
| SW: GW to SW, HFC       | Tox./Persis./Bioacc. 1.00E+03  | 10     | 10     |
| SW: GW to SW, Env       | Etox./Persis./Bioacc. 1.00E+04 | 10     | 18     |
| Soil Exposure: Resident | Toxicity 1.00E+04              | 10     | 18     |
| Soil Exposure: Nearby   | Toxicity 1.00E+04              | 10     | 18     |
| Air                     | Toxicity/Mobility 2.00E+02     | 10     | 6      |

\* Hazardous Waste Quantity Factor Values

\*\* Waste Characteristics Factor Category Values

Note: SW = Surface Water  
 GW = Ground Water  
 DW = Drinking Water Threat  
 HFC = Human Food Chain Threat  
 Env = Environmental Threat

- Stream

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GROUND WATER MIGRATION PATHWAY SCORESHEET  
Olin, Wallsville Road - 07/24/95

PAGE: 1

| GROUND WATER MIGRATION PATHWAY<br>Factor Categories & Factors      | Maximum<br>Value | Value<br>Assigned |
|--|------------------|-------------------|
| Likelihood of Release to an Aquifer<br>Aquifer: Evangeline aquifer |                  |                   |
| 1. Observed Release  | 550              | 0                 |
| 2. Potential to Release  |                  |                   |
| 2a. Containment  | 10               | 10                |
| 2b. Net Precipitation  | 10               | 3                 |
| 2c. Depth to Aquifer   | 5                | 1                 |
| 2d. Travel Time  | 35               | 5                 |
| 2e. Potential to Release<br>[lines 2a(2b+2c+2d)]                   | 500              | 90                |
| 3. Likelihood of Release   | 550              | 230               |
| Waste Characteristics  |                  |                   |
| 4. Toxicity/Mobility   | *                | 2.00E-01          |
| 5. Hazardous Waste Quantity  | *                | 10                |
| 6. Waste Characteristics   | 100              | 1                 |
| Targets  |                  |                   |
| 7. Nearest Well  | 50               | 2.00E+00          |
| 8. Population  |                  |                   |
| 8a. Level I Concentrations   | **               | 0.00E+00          |
| 8b. Level II Concentrations  | **               | 0.00E+00          |
| 8c. Potential Contamination  | **               | 1.31E+02          |
| 8d. Population (lines 8a+8b+8c)                                    | **               | 1.31E+02          |
| 9. Resources   | 5                | 0.00E+00          |
| 10. Wellhead Protection Area                                       | 20               | 0.00E+00          |
| 11. Targets (lines 7+8d+9+10)                                      | **               | 1.33E+02          |
| 12. Targets (including overlaying aquifers)                        | **               | 1.38E+02          |
| 13. Aquifer Score  | 100              | 0.38              |
| GROUND WATER MIGRATION PATHWAY SCORE (Sgw)                         | 100              | 0.38              |

\* Maximum value applies to waste characteristics category.  
\*\* Maximum value not applicable.

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GROUND WATER PATHWAY AQUIFER SUMMARY  
Olin, Wallsville Road - 07/24/95

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| No. Aquifer ID       | Type  | Overlaying No. | Inter-Connected with | Likelihood of Release | Targets  |
|----------------------|-------|----------------|----------------------|-----------------------|----------|
| 1 Chicot Aquifer     | Non K | 0              | 0                    | 230                   | 2.00E+01 |
| 2 Evangeline aquifer | Non K | 1              | 1                    | 230                   | 1.38E+02 |

Containment

| No.   | Source ID          | HWQ Value | Containment Value |
|-------|--------------------|-----------|-------------------|
| 1     | Soils on site      | 2.31E+01  | 10                |
| ===== |                    |           |                   |
|       | Containment Factor |           | 10                |

Documentation for Ground Water Containment, Source Soils on site:

Reference 9, Table 3-2. Evidence of hazardous substance migration from the area, and no liner.

Reference: 9

Net Precipitation

Net Precipitation (inches) N.A.

Documentation for Net Precipitation:

HRS Figure 3-2 was used to determine a net precipitation factor of 3 (Ref 9, figure 3-2).

Reference: 9

Aquifer: Chicot Aquifer

Type of Aquifer: Non Karst

Overlaying Aquifer: 0

Interconnected with: 0

Documentation for Chicot Aquifer      Aquifer:

The site is underlain by the Pleistocene Beaumont Formation (thickness 100+ ft.) which in turn is underlain by the Montgomery Formation (approximate thickness of 100+ ft. beneath site). Both units are composed of fluvial deltaic deposits of alternating clay, silt, sand and gravel beds, and are considered the two upper units of the Chicot Aquifer (Ref. 06, 002; Ref.25,002-003).

Reference: 6,25

OBSERVED RELEASE

| No.                             | Well ID | Well Type | Distance<br>(miles) | Level of Contamination |
|---------------------------------|---------|-----------|---------------------|------------------------|
| - N/A and/or data not specified |         |           |                     |                        |

=====

|                         |   |
|-------------------------|---|
| Observed Release Factor | 0 |
|-------------------------|---|

POTENTIAL TO RELEASE

Containment

Containment Factor 10

Net Precipitation

Net Precipitation Factor 3

Depth to Aquifer

A. Depth of Hazardous Substances 3.00 feet

Documentation for Depth of Hazardous Substances:

Depth of contamination has not been established at the site. Sampling data exhibited contamination within the upper three feet of surface soils (Ref.9,003; Ref.11), therefore a depth of three feet was assigned.

Reference: 9,11

B. Depth to Aquifer from Surface 20.00 feet

Documentation for Depth to Aquifer from Surface :

As Per EPA Site Inspection Report (Ref 03, 008).

Reference: 3

C. Depth to Aquifer (B - A) 17.00 feet

Depth to Aquifer Factor 5

Travel Time

Are All Layers Karst? NO

Thickness of Layer(s) with Lowest Conductivity 20.00 feet

Documentation for Thickness of Layers with Lowest Conductivity:

Subsurface of this site has not been characterized, although historic reports on the subsurface of the general area within which the site lies indicate that it may be highly variable. As stated within file references, "Because the subsurface geology is highly variable, it is very difficult to determine the configuration of subsurface soils in the proximity of the site. In order to determine the local subsurface soil structure, site specific investigation is necessary." (Ref. 13, Attachment C, 001). However, the primary constituents of the surface soils located beneath the site is clay and mud of low permeability (Ref.25). Therefore, the surface soils (to the depth of the aquifer) were determined to have the lowest conductivity (depth of 20 feet).

Reference: 13,25

Hydraulic Conductivity (cm/sec) 1.0E-07

Documentation for Hydraulic Conductivity:

As per EPA Site Inspection Report (Ref 03, 009)

Reference: 3

Travel Time Factor 15



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GROUND WATER PATHWAY LIKELIHOOD OF RELEASE Chicot Aquifer  
Olin, Wallsiville Road - 07/24/95

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AQUIFER

=====

|                             |     |
|-----------------------------|-----|
| Potential to Release Factor | 230 |
|-----------------------------|-----|

Aquifer: Evangeline aquifer

Type of Aquifer: Non Karst

Overlaying Aquifer: 1

Interconnected with: 1

Documentation for Evangeline aquifer Aquifer:

The Evangeline aquifer is geologically similar to the Chicot aquifer-consisting of fluvial deltaic deposits of alternating layers of clays, silts, sands, and gravels. The Chicot and the Evangeline are considered an undifferentiated coastal aquifer, delineated only by the Evangeline's smaller hydraulic conductivity (Ref. 23-002; Ref. 24,002-004)

Reference: 23,24

OBSERVED RELEASE

| No. | Well ID | Well Type | Distance<br>(miles) | Level of Contamination |
|-----|---------|-----------|---------------------|------------------------|
|-----|---------|-----------|---------------------|------------------------|

- N/A and/or data not specified

=====

|                         |   |
|-------------------------|---|
| Observed Release Factor | 0 |
|-------------------------|---|

POTENTIAL TO RELEASE

Containment

Containment Factor 10

Net Precipitation

Net Precipitation Factor 3

Depth to Aquifer

A. Depth of Hazardous Substances 3.00 feet

Documentation for Depth of Hazardous Substances:

The depth of contamination was not stated within the file information. However, sampling data exhibited contamination within the upper 3 feet of the surface soils (Ref.9-003-004; Ref.11), therefore, a depth of 3 feet was assigned.

Reference: 9,11

B. Depth to Aquifer from Surface 800.00 feet

Documentation for Depth to Aquifer from Surface :

The depth to the Evangeline aquifer was determined through interpretation of hydrologic unit cross-sections (Ref.24-)

Reference: 24

C. Depth to Aquifer (B - A) 797.00 feet

Depth to Aquifer Factor 1

Travel Time

Are All Layers Karst? NO

Thickness of Layer(s) with Lowest Conductivity 0.00 feet

Hydraulic Conductivity (cm/sec) 0.0E-00

Travel Time Factor 5

=====

|                             |    |
|-----------------------------|----|
| Potential to Release Factor | 90 |
|-----------------------------|----|

=====

Source: 1 Soils on site

Source Hazardous Waste Quantity Value: 23.06

| Hazardous Substance     | Toxicity<br>Value | Mobility<br>Value | Toxicity/<br>Mobility<br>Value |
|-------------------------|-------------------|-------------------|--------------------------------|
| DDD                     | 100               | 2.00E-07          | 2.00E-05                       |
| DDE                     | 100               | 2.00E-07          | 2.00E-05                       |
| DDT                     | 1000              | 2.00E-07          | 2.00E-04                       |
| Lindane                 | 10000             | 2.00E-05          | 2.00E-01                       |
| Pentachloronitrobenzene | 1000              | 2.00E-05          | 2.00E-02                       |
| Toxaphene               | 1000              | 2.00E-05          | 2.00E-02                       |

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GROUND WATER PATHWAY WASTE CHARACTERISTICS  
Olin, Wallsiville Road - 07/24/95

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Hazardous Substances Found in an Observed Release

| Well<br>No. | Observed Release<br>Hazardous Substance | Toxicity<br>Value | Mobility<br>Value | Toxicity/<br>Mobility<br>Value |
|-------------|---|-------------------|-------------------|--------------------------------|
|-------------|---|-------------------|-------------------|--------------------------------|

---

- N/A and/or data not specified

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GROUND WATER PATHWAY WASTE CHARACTERISTICS  
Olin, Wallsiville Road - 07/24/95

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|   |          |
|---|----------|
| Toxicity/Mobility Value from Source Hazardous Substances:           | 2.00E-01 |
| Toxicity/Mobility Value from Observed Release Hazardous Substances: | 0.00E+00 |
| Toxicity/Mobility Factor:   | 2.00E-01 |
| Sum of Source Hazardous Waste Quantity Values:                      | 2.31E+01 |
| Hazardous Waste Quantity Factor:                                    | 10       |
| Waste Characteristics Factor Category:                              | 1        |

Population by Well

| No. | Well ID | Sample Type | Distance<br>(miles) | Level of<br>Contamination Population |
|-----|---------|-------------|---------------------|--------------------------------------|
|-----|---------|-------------|---------------------|--------------------------------------|

- N/A and/or data not specified

Level I Population Factor: 0.00

Level II Population Factor: 0.00



Potential Contamination by Distance Category

| Distance Category<br>(miles) | Population | Value    |
|------------------------------|------------|----------|
| > 0 to 1/4                   | 0.0        | 0.00E+00 |
| > 1/4 to 1/2                 | 0.0        | 0.00E+00 |
| > 1/2 to 1                   | 0.0        | 0.00E+00 |
| > 1 to 2                     | 0.0        | 0.00E+00 |
| > 2 to 3                     | 0.0        | 0.00E+00 |
| > 3 to 4                     | 2000.0     | 1.31E+01 |

Potential Contamination Factor: 13.000

Documentation for Target Population > 3 to 4 miles Distance Category:

Jacinto City has three drinking water wells drawing from the Chicot aquifer within the 3-4 mile radius of the site (Ref.18,001-004). Ground water supplies 20% of the total drinking water resources. The other 80% is supplied by City of Houston surface water sources. A total population of 10,000 is served by these wells (Ref.16). Overall attribution of ground water is detailed below:

(10,000 people) (.2) = 2,000 people served.

Reference: 16,18

Nearest Well

Level of Contamination: Potential  
Distance in miles: 3.20

Nearest Well Factor: 2.00E+00

Documentation for Nearest Well:

Distance of 3.2 miles to the nearest drinking water well, the Jacinto City well (municipal supply). The distance was obtained by plotting well positions onto the USGS map for the site area and measuring the distance from the site to the wells. This was verified by comparing distances to the Harris/Galveston Coastal Subsidence District database information which included radial distance from the site to the listed wells (Ref. 07, 001)

Reference: 7

Resources

Resource Use: YES

Resource Factor: 5.00E+00

Documentation for Resources:

Ground water is used in formulation of vinegar on a commercial scale, therefore ground water has a use as a resource. The well is approximately 3.5 miles from the site (Ref. 7,003; Ref.10)

Reference: 10,7

Wellhead Protection Area

No wellhead protection area

Wellhead Protection Area Factor: 0.00E+00

Documentation for Wellhead Protection Area:

TNRCC personnel confirmed that a wellhead protection area does not exist within 4 miles of the site (Ref. 11,001).

Reference: 11

Population by Well

| No. | Well ID | Sample Type | Distance<br>(miles) | Level of<br>Contamination | Population |
|-----|---------|-------------|---------------------|---------------------------|------------|
|-----|---------|-------------|---------------------|---------------------------|------------|

- N/A and/or data not specified

Level I Population Factor: 0.00

Level II Population Factor: 0.00

Potential Contamination by Distance Category

| Distance Category<br>(miles) | Population | Value    |
|------------------------------|------------|----------|
| > 0 to 1/4                   | 0.0        | 0.00E+00 |
| > 1/4 to 1/2                 | 0.0        | 0.00E+00 |
| > 1/2 to 1                   | 0.0        | 0.00E+00 |
| > 1 to 2                     | 0.0        | 0.00E+00 |
| > 2 to 3                     | 0.0        | 0.00E+00 |
| > 3 to 4                     | 18695.0    | 1.31E+02 |

Potential Contamination Factor: 131.000

Documentation for Target Population > 3 to 4 miles Distance Category:

There are three City of Houston wells located within the 3-4 mile radius of the site. These wells draw water from the Evangeline aquifer at an average depth of 1500 feet. Each well serves an approximate population of 6,232; three wells an average of 18,695 people (Ref.21, 001).

Reference: 21

Nearest Well

Level of Contamination: Potential  
Distance in miles: 3.30

Nearest Well Factor: 2.00E+00

Documentation for Nearest Well:

The nearest well drawing water from the Evangeline aquifer is identified as a City of Houston water well (well #1), and is located approximately 3.3 miles from the site, at a depth of 1993 feet (Ref 15,001-004).

Reference: 15

#### Resources

Resource Use: NO

Resource Factor: 0.00E+00

#### Documentation for Resources:

No resources identified (Ref 7,001-004).

Reference: 7

#### Wellhead Protection Area

No wellhead protection area

Wellhead Protection Area Factor: 0.00E+00

#### Documentation for Wellhead Protection Area:

TNRCC personnel have verified that no wellhead protection area exists within a 4-mile radius of the site (Ref.11,001).

Reference: 11

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 SOIL EXPOSURE PATHWAY SCORESHEET  
 Olin, Wallsiville Road - 07/24/95

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| SOIL EXPOSURE PATHWAY<br>Factor Categories & Factors<br>RESIDENT POPULATION THREAT | Maximum<br>Value | Value<br>Assigned |
|--|------------------|-------------------|
| Likelihood of Exposure   |                  |                   |
| 1. Likelihood of Exposure  | 550              | 550               |
| Waste Characteristics  |                  |                   |
| 2. Toxicity  | *                | 1.00E+04          |
| 3. Hazardous Waste Quantity  | *                | 10                |
| 4. Waste Characteristics   | 100              | 18                |
| Targets  |                  |                   |
| 5. Resident Individual   | 50               | 5.00E+01          |
| 6. Resident Population   |                  |                   |
| 6a. Level I Concentrations   | **               | 8.20E+01          |
| 6b. Level II Concentrations  | **               | 0.00E+00          |
| 6c. Resident Population (lines 6a+6b)  | **               | 8.20E+01          |
| 7. Workers   | 15               | 5.00E+00          |
| 8. Resources   | 5                | 0.00E+00          |
| 9. Terrestrial Sensitive Environments  | ***              | 0.00E+00          |
| 10. Targets (lines 5+6c+7+8+9)   | **               | 1.37E+02          |
| 11. RESIDENT POPULATION THREAT SCORE   | **               | 1.36E+06          |

\* Maximum value applies to waste characteristics category.

\*\* Maximum value not applicable.

\*\*\* No specific maximum value applies, see HRS for details.

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 SOIL EXPOSURE PATHWAY SCORESHEET  
 Olin, Wallsiville Road - 07/24/95

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| SOIL EXPOSURE PATHWAY<br>Factor Categories & Factors<br>NEARBY POPULATION THREAT | Maximum<br>Value | Value<br>Assigned |
|--|------------------|-------------------|
| Likelihood of Exposure   |                  |                   |
| 12. Attractiveness/Accessibility   | 100              | 5.00E+00          |
| 13. Area of Contamination  | 100              | 1.00E+02          |
| 14. Likelihood of Exposure   | 500              | 5.00E+01          |
| Waste Characteristics  |                  |                   |
| 15. Toxicity   | *                | 1.00E+04          |
| 16. Hazardous Waste Quantity   | *                | 10                |
| 17. Waste Characteristics  | 100              | 18                |
| Targets  |                  |                   |
| 18. Nearby Individual  | 1                | 0.00E+00          |
| 19. Population Within 1 Mile   | **               | 4.00E+00          |
| 20. Targets (lines 18+19)  | **               | 4.00E+00          |
| 21. NEARBY POPULATION THREAT SCORE   | **               | 3.60E+03          |
| SOIL EXPOSURE PATHWAY SCORE (Ss)   | 100              | 16.48             |

\* Maximum value applies to waste characteristics category.

\*\* Maximum value not applicable.



Likelihood of Exposure

No. Source ID Level of Contamination

|                                    |               |         |
|------------------------------------|---------------|---------|
| 1                                  | Soils on site | Level I |
| Likelihood of Exposure Factor: 550 |               |         |

Documentation for Area of Contamination, Source Soils on site:

Conservative estimate based on entire site acreage (18 acres)  
 multiplied by 43,560 square feet per acre (Ref.3,003).

Reference: 3

| Source No. | Hazardous Substance     | Depth (ft.) | Concent. | Cancer  | RFD     | Units |
|------------|-------------------------|-------------|----------|---------|---------|-------|
| 1          | DDD                     | < 2         | 1.0E+02  | 2.4E+00 | 0.0E+00 | ppm   |
| 1          | DDE                     | < 2         | 1.0E+02  | 1.7E+00 | 0.0E+00 | ppm   |
| 1          | DDT                     | < 2         | 1.0E+02  | 1.7E+00 | 2.9E+02 | ppm   |
| 1          | Lindane                 | < 2         | 1.0E+02  | 4.5E-01 | 1.7E+02 | ppm   |
| 1          | Pentachloronitrobenzene | < 2         | 1.0E+02  | 2.2E+00 | 1.7E+03 | ppm   |
| 1          | Toxaphene               | < 2         | 1.0E+03  | 5.3E-01 | 0.0E+00 | ppm   |

Documentation for Source Soils on site, Contaminants:

Based on conversations with TNRCC field sampling personnel, there are 6 major contaminants on site: lindane, pentachloronitrobenzene, 4,4'-DDT; 4,4'-DDD; 4,4'-DDE, and toxaphene (Ref 12, 001). This is echoed by the EPA Potential Hazardous Waste Site inspection Report (Ref 03, p. 3)

Reference: 3, 12

Source: 1 Soils on site

Source Hazardous Waste Quantity Value: 23.06

| Hazardous<br>Substance  | Toxicity<br>Value |
|-------------------------|-------------------|
| DDD                     | 100               |
| DDE                     | 100               |
| DDT                     | 1000              |
| Lindane                 | 10000             |
| Pentachloronitrobenzene | 1000              |
| Toxaphene               | 1000              |

|  |          |
|--|----------|
| Toxicity Factor:                               | 1.00E+04 |
| Sum of Source Hazardous Waste Quantity Values: | 2.31E+01 |
| Hazardous Waste Quantity Factor:               | 10       |
| Waste Characteristics Factor Category:         | 18       |

Targets

Level I Population: 8.2 Value: 82.00

Documentation for Level I Population:

Historic sampling has confirmed that at least one resident located adjacent to the site has toxaphene contamination (up to 156 ppm) within the soils (Ref.17,005). The number of residents possibly affected by the soil contamination was determined through topographic interpretation (house count). There are three residences located along the northern site boundary. Each residence is estimated to house an average population of 2.72 (Ref.22,002). Therefore it is estimated that 8.2 people may be affected by source contaminants. No schools or daycare centers are located within 200 feet of an area of observed contamination (Ref.20).

Reference: 17,22,20

Level II Population: 0.0 Value: 0.00

Workers: 50.0 Value: 5.00

Documentation for Workers:

The site does not support any commercial enterprise; however, there are some workers on the property of Mustang equipment, which lies adjacent to the site and therefore may be considered "within 200 ft." of the site (Ref.03,003).

Reference: 3

Resident Individual: Level I Value: 50.00

Resources: NO Value: 0.00

Documentation for Resources:

No resources identified Ref.9).

Reference: 9

| Terrestrial Sensitive Environment | Value |
|-----------------------------------|-------|
|-----------------------------------|-------|

|                                 |  |
|---------------------------------|--|
| - N/A and/or data not specified |  |
|---------------------------------|--|

=====

Terrestrial Sensitive Environments Factor: 0.00

Likelihood of Exposure

| No. Source ID                                      | Level of Contamination | Attractiveness/ Accessibility | Area of Contam. (sq. feet) |
|--|------------------------|-------------------------------|----------------------------|
| 1 Soils on site                                    | Level I                | 5                             | 784080                     |
| Highest Attractiveness/Accessibility Value:        |                        |                               | 5                          |
| Sum of Eligible Areas Of Contamination (sq. feet): |                        |                               | 784080                     |
| Area of Contamination Value: 100                   |                        |                               |                            |

Likelihood of Exposure Factor Category: 50

Documentation for Attractiveness/Accessibility, Source Soils on site:

The site is currently fenced and located adjacent to an area of residential development; as well, it borders a railroad and a rail yard (Ref. 09, table 5-6).

Reference: 9

| Source Hazardous Substance No. | Depth (ft.) | Concent. | Cancer  | RFD     | Units |
|--------------------------------|-------------|----------|---------|---------|-------|
| 1 DDD                          | < 2         | 1.0E+02  | 2.4E+00 | 0.0E+00 | ppm   |
| 1 DDE                          | < 2         | 1.0E+02  | 1.7E+00 | 0.0E+00 | ppm   |
| 1 DDT                          | < 2         | 1.0E+02  | 1.7E+00 | 2.9E+02 | ppm   |
| 1 Lindane                      | < 2         | 1.0E+02  | 4.5E-01 | 1.7E+02 | ppm   |
| 1 Pentachloronitrobenzene      | < 2         | 1.0E+02  | 2.2E+00 | 1.7E+03 | ppm   |
| 1 Toxaphene                    | < 2         | 1.0E+03  | 5.3E-01 | 0.0E+00 | ppm   |

Documentation for Source Soils on site, Contaminants:

Based on conversations with TNRCC field sampling personnel, there are 6 major contaminants on site: lindane, pentachloronitrobenzene, 4,4'-DDT; 4,4'-DDD; 4,4'-DDE, and toxaphene (Ref 12, 001). This is echoed by the EPA Potential Hazardous Waste Site inspection Report (Ref 03, p. 3)

Reference: 3, 12

Source: 1 Soils on site

Source Hazardous Waste Quantity Value: 23.06

| Hazardous<br>Substance  | Toxicity<br>Value |
|-------------------------|-------------------|
| DDD                     | 100               |
| DDE                     | 100               |
| DDT                     | 1000              |
| Lindane                 | 10000             |
| Pentachloronitrobenzene | 1000              |
| Toxaphene               | 1000              |

|  |          |
|--|----------|
| Toxicity Factor:                               | 1.00E+04 |
| Sum of Source Hazardous Waste Quantity Values: | 2.31E+01 |
| Hazardous Waste Quantity Factor:               | 10       |
| Waste Characteristics Factor Category:         | 18       |



Nearby Individual

Population within 1/4 mile: 174.0

Nearby Individual Value: 0.0

Population Within 1 Mile

| Travel Distance Category         | Number of People | Value |
|----------------------------------|------------------|-------|
| > 0 to 1/4 mile                  | 174.0            | 0.4   |
| > 1/4 to 1/2 mile                | 0.0              | 0.0   |
| > 1/2 to 1 mile                  | 7588.0           | 3.3   |
| Population Within 1 Mile Factor: |                  | 4.0   |

Documentation for Population > 0 to 1/4 mile Distance Category:

U.S. Environmental Protection Agency, Geographical Exposure Modeling System (GEMS) Database, compiled from the U.S. Census Bureau 1990 data, accessed 3/27/95 (Ref 05, 002).

Reference: 5

Documentation for Population > 1/4 to 1/2 mile Distance Category:

No population in this distance limit according to data derived from U.S. EPA GEMS database (Ref. 05, 002).

Reference: 5

Documentation for Population > 1/2 to 1 mile Distance Category:

There are 7588 people living in this target limit according to data derived from U.S. EPA GEMS database (Ref. 05, 002).

Reference: 5

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 AIR PATHWAY SCORESHEET  
 Olin, Wallsville Road - 07/24/95

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| AIR MIGRATION PATHWAY<br>Factor Categories & Factors | Maximum<br>Value | Value<br>Assigned |
|--|------------------|-------------------|
| Likelihood of Release                                |                  |                   |
| 1. Observed Release                                  | 550              | 0                 |
| 2. Potential to Release                              |                  |                   |
| 2a. Gas Potential to Release                         | 500              | 300               |
| 2b. Particulate Potential to Release                 | 500              | 330               |
| 2c. Potential to Release                             | 500              | 330               |
| 3. Likelihood of Release                             | 550              | 330               |
| Waste Characteristics                                |                  |                   |
| 4. Toxicity/Mobility                                 | *                | 2.00E+02          |
| 5. Hazardous Waste Quantity                          | *                | 10                |
| 6. Waste Characteristics                             | 100              | 6                 |
| Targets  |                  |                   |
| 7. Nearest Individual                                | 50               | 2.00E+01          |
| 8. Population  |                  |                   |
| 8a. Level I Concentrations                           | **               | 0.00E+00          |
| 8b. Level II Concentrations                          | **               | 0.00E+00          |
| 8c. Potential Contamination                          | **               | 4.00E+01          |
| 8d. Population (lines 8a+8b+8c)                      | **               | 4.00E+01          |
| 9. Resources   | 5                | 0.00E+00          |
| 10. Sensitive Environments                           |                  |                   |
| 10a. Actual Contamination                            | ***              | 0.00E+00          |
| 10b. Potential Contamination                         | ***              | 0.00E+00          |
| 10c. Sens. Environments (lines 10a+10b)              | ***              | 0.00E+00          |
| 11. Targets (lines 7+8d+9+10c)                       | **               | 6.00E+01          |
| AIR MIGRATION PATHWAY SCORE (Sa)                     | 100              | 1.44E+00          |

\* Maximum value applies to waste characteristics category.

\*\* Maximum value not applicable.

\*\*\* No specific maximum value applies, see HRS for details.

OBSERVED RELEASE

| No. Sample ID | Distance<br>(miles) | Level of Contamination |
|---------------|---------------------|------------------------|
|---------------|---------------------|------------------------|

- N/A and/or data not specified

=====

Observed Release Factor: 0

Gas Migration Potential

GAS POTENTIAL TO RELEASE

| Source ID     | Source Type       | Gas Contain.<br>Value<br>(A) | Gas Source<br>Type<br>Value<br>(B) | Gas Migrtn.<br>Potent.<br>Value<br>(C) | Sum<br>(B+C) | Gas<br>Potential<br>to Rel.<br>Value<br>A(B+C) |
|---------------|-------------------|------------------------------|------------------------------------|--|--------------|--|
| Soils on site | Contaminated Soil | 10                           | 19                                 | 11                                     | 30           | 300  |

Gas Potential to Release Factor: 300

Documentation for Gas Containment, Source Soils on site:

Source contains less than 1 ft. of clean cover and is not heavily vegetated (Ref 9, table 6-3).

Reference: 9

Documentation for Source Type, Source Soils on site:

Main constituent of concern on site is contaminated soils (Ref 03, p. 6).

Reference: 3

Source: Soils on site

| Gaseous Hazardous Substance | Hazardous Substance Gas<br>Migration Potential Value |
|-----------------------------|--|
| DDD                         | 6  |
| DDE                         | 6  |
| DDT                         | 6  |
| Lindane                     | 11   |
| Pentachloronitrobenzene     | 11   |
| Toxaphene                   | 6  |

Average of Gas Migration Potential Value for 3 Hazardous Substances: 9.333  
=====

Gas Migration Potential Value From Table 6-7: 11

Particulate Migration Potential

PARTICULATE POTENTIAL TO RELEASE

| Source ID     | Source Type       | Partic. Contain. Value (A) | Partic. Source Type Value (B) | Partic. Migrtn. Potent. Value (C) | Sum (B+C) | Partic. Potential to Rel. Value A(B+C) |
|---------------|-------------------|----------------------------|-------------------------------|-----------------------------------|-----------|--|
| Soils on site | Contaminated Soil | 10                         | 22                            | 11                                | 33        | 330                                    |

Particulate Potential to Release Factor: 330

Documentation for Particulate Containment, Source Soils on site:

Source area contains less than 1 ft. of clean cover and is not heavily vegetated (Ref 09, table 6-9).

Reference: 9

Documentation for Source Type, Source Soils on site:

Main constituent of concern on site is contaminated soils (Ref 03, p. 6).

Reference: 3

Documentation for Particulate Migration Potential:

Figure 6-2 used to determine a particulate migration potential factor of 11 (Ref 01, figure 6-2).

Reference: 1



Source: Soils on site

Particulate Hazardous Substance

---

DDD  
DDE  
DDT  
Lindane  
Pentachloronitrobenzene  
Toxaphene

Source: 1 Soils on site

Source Hazardous Waste Quantity Value: 23.06

| Hazardous Substance     | Toxicity<br>Value | Gas<br>Mobility<br>Value | Particulate<br>Mobility<br>Value | Toxicity/<br>Mobility<br>Value |
|-------------------------|-------------------|--------------------------|----------------------------------|--------------------------------|
| DDD                     | 100               | 2.00E-03                 | 8.00E-04                         | 2.00E-01                       |
| DDE                     | 100               | 2.00E-03                 | 8.00E-04                         | 2.00E-01                       |
| DDT                     | 1000              | 2.00E-03                 | 8.00E-04                         | 2.00E+00                       |
| Lindane                 | 10000             | 2.00E-02                 | 8.00E-04                         | 2.00E+02                       |
| Pentachloronitrobenzene | 1000              | 2.00E-02                 | 8.00E-04                         | 2.00E+01                       |
| Toxaphene               | 1000              | 2.00E-03                 | 8.00E-04                         | 2.00E+00                       |

Hazardous Substances Found in an Observed Release

| Sample ID | Observed Release<br>Hazardous Substance | Particulate<br>Toxicity/<br>Mobility Value | Gas<br>Toxicity/<br>Mobility Value |
|-----------|---|--|------------------------------------|
|-----------|---|--|------------------------------------|

---

- N/A and/or data not specified

Documentation for Particulate Mobility:

Figure 6-3 was used to determine a particulate mobility factor of .0008 (Ref 01, figure 6-3).

Reference: 1

|   |          |
|---|----------|
| Toxicity/Mobility Value from Source Hazardous Substances:           | 2.00E+02 |
| Toxicity/Mobility Value from Observed Release Hazardous Substances: | 0.00E+00 |
| Toxicity/Mobility Factor:   | 2.00E+02 |
| Sum of Source Hazardous Waste Quantity Values:                      | 2.31E+01 |
| Hazardous Waste Quantity Factor:                                    | 10       |
| Waste Characteristics Factor Category:                              | 6        |

## AIR PATHWAY TARGETS

Olin, Wallsville Road - 07/24/95

## Actual Contamination

| No. Sample ID | Distance<br>(miles) | Level of Contamination |
|---------------|---------------------|------------------------|
|---------------|---------------------|------------------------|

---

- N/A and/or data not specified

Potential ContaminationDistance Categories Subject  
to Potential Contamination

|                   | Population | Value   |
|-------------------|------------|---------|
| Onsite            | 0.0        | 0.0000  |
| > 0 to 1/4 mile   | 174.0      | 4.1000  |
| > 1/4 to 1/2 mile | 0.0        | 0.0000  |
| > 1/2 to 1 mile   | 7588.0     | 8.3000  |
| > 1 to 2 miles    | 25074.0    | 8.3000  |
| > 2 to 3 miles    | 38483.0    | 12.0000 |
| > 3 to 4 miles    | 85146.0    | 7.3000  |

---

Potential Contaminantion Factor: 40.0000

## Documentation for Population Onsite Distance Category:

Conversation with current TNRCC project manager regarding current onsite conditions (Ref 01, 001).

Reference: 1

## Documentation for Population &gt; 0 to 1/4 mile Distance Category:

U.S. EPA GEMS population database, (Ref 20, 002-003).

Reference: 20

AIR PATHWAY TARGETS

Olin, Wallsville Road - 07/24/95

Documentation for Population > 1/4 to 1/2 mile Distance Category:

U.S. EPA GEMS population database (Ref 20, 002-003).

Reference: 20

Documentation for Population > 1/2 to 1 mile Distance Category:

U.S. EPA GEMS population database, (Ref 20, 002-003).

Reference: 20

Documentation for Population > 1 to 2 miles Distance Category:

U.S. EPA GEMS population database (Ref 20, 002-003).

Reference: 20

Documentation for Population > 2 to 3 miles Distance Category:

U.S. EPA GEMS population database (Ref 20, 002-003).

Reference: 20

Documentation for Population > 3 to 4 miles Distance Category:

U.S. EPA GEMS population database (Ref. 20, 002-003).

Reference: 20

## AIR PATHWAY TARGETS

Olin, Wallsiville Road - 07/24/95

Nearest Individual Factor

Level of Contamination: Potential

Distance in miles: 0 to 1/8

Nearest Individual Value: 20

## Documentation for Nearest Individual:

Site-related contamination (toxaphene) was found within soils obtained from residences immediately bordering the site (Ref. 17, p. 5) . Based on this information, and using table 6-16 within the HRS guidance, a value of 20 was assigned (Ref. 09, table 6-16).

Reference: 17, 9

Resources

Resource Use: NO

Resource Value: 0

## Documentation for Resources:

Resources have not been identified within the area surrounding the site and within the 4-mile target distance limit (Ref. 10, 001).

Reference: 10

Actual Contamination, Sensitive Environments

| Sensitive Environment           | Distance<br>(miles) | Sensitive<br>Environment<br>Value |
|---------------------------------|---------------------|-----------------------------------|
| - N/A and/or data not specified |                     |                                   |

Actual Contamination, Wetlands

| Distance<br>Category            | Wetland<br>Acreage | Wetland<br>Acreage Value |
|---------------------------------|--------------------|--------------------------|
| - N/A and/or data not specified |                    |                          |

=====  
Sensitive Environments Actual Contamination Factor: 0.000  
(Sum of Sensitive Environments + Wetlands Values)



## AIR PATHWAY TARGETS

Olin, Wallsiville Road - 07/24/95

## Potential Contamination, Sensitive Environments

| Sensitive Environment | Distance<br>(miles) | Sensitive<br>Environment<br>Value | Distance<br>Weight | Weighted<br>Value/10 |
|-----------------------|---------------------|-----------------------------------|--------------------|----------------------|
|                       | 0.000               | 0                                 | 1.0000             | 0.000                |

## Potential Contamination, Wetlands

| Distance<br>Category            | Wetland<br>Acreage | Wetland<br>Acreage Value | Distance<br>Weight | Weighted<br>Value/10 |
|---------------------------------|--------------------|--------------------------|--------------------|----------------------|
| - N/A and/or data not specified |                    |                          |                    |                      |

=====

Sensitive Environment Potential Contamination Factor: 0.000

## Documentation for Sensitive Environment :

No sensitive environments within 15-mile TDL (Ref. 18, 001).

Reference: 18

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Olin, Wallsiville Road - 07/24/95

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8. Harris-Galveston Coastal Subsidence District computer search of public  
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11. Record of Communication To: Dave Terry, Texas Natural Resources  
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12. Record of Communication To: Johnnie Kennedy, Texas TNRCC, From: Ken  
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15. Harris-Galveston Coastal Subsidence District database printout of Registered Wells located within a 4-mile Radius of the Site. 5/19/95.
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18. Record of Communication to: Shannon Breslin, Texas Natural Heritage Program From: Ken Jensen, Fluor Daniel, Inc., Re: Threatened or Endangered Species Within the TDL of S.P. Oliver Site 5/23/95.
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20. U.S. Geological Survey, 7.5 Minute Series Topographic Maps: Settegast (1982), Jacinto City (1982), Park Place (1982) and Pasadena (1983) Texas.
21. Texas Water Resources Data, Water Year 1991, Volume 2. San Jacinto River Basin, Brazos River Basin, San Bernard River Basin, and Intervening Coastal Basins. U.S. Geological Survey Report TX-91-2.
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